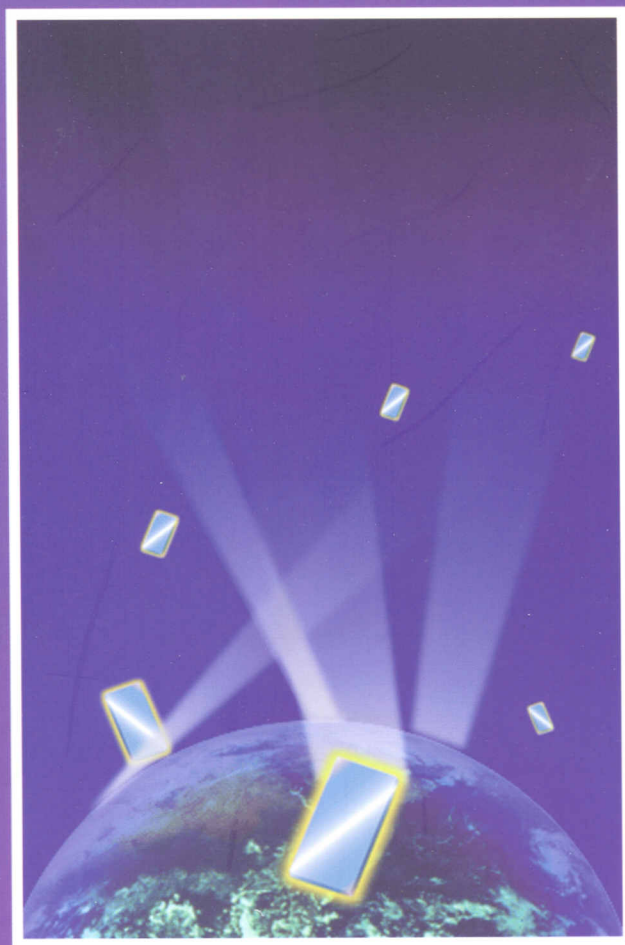


LCD & LCM

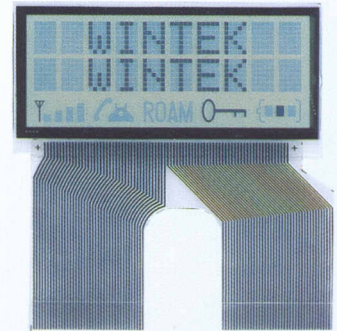
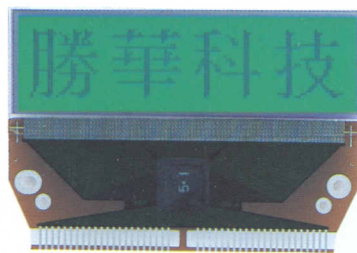
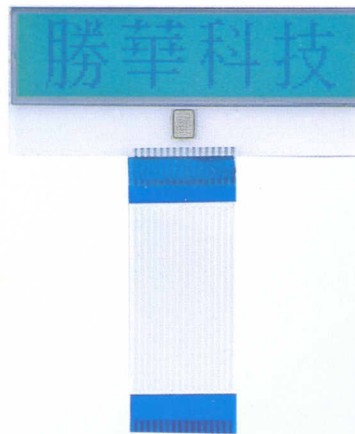
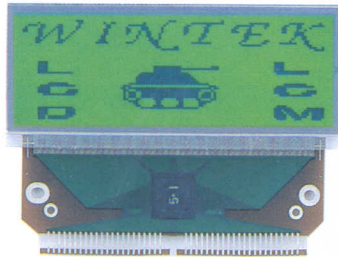
PROFESSIONAL MANUFACTURER



勝華科技股份有限公司
WINTEK CORPORATION



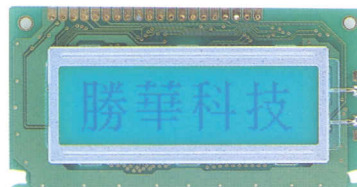
NEW PRODUCTS



GRAPHIC TYPE LCM



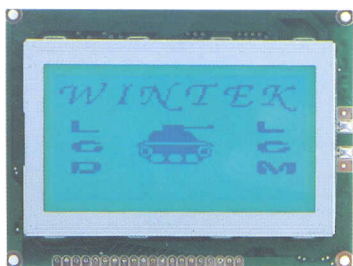
● WM-G2412A-1BFW



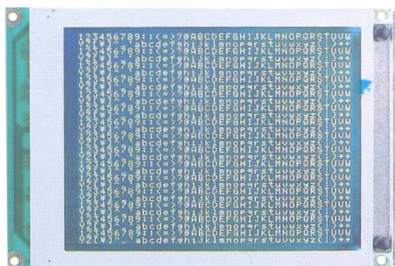
● WM-G1203M-1GEB



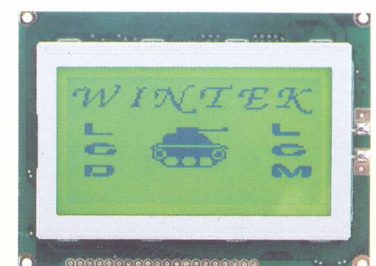
● WM-G2406A-1WFW



● WM-G1206A-1GEB



● WM-G3224A-1WFW



● WM-G1206A-1YEG



CHARACTER TYPE LCM



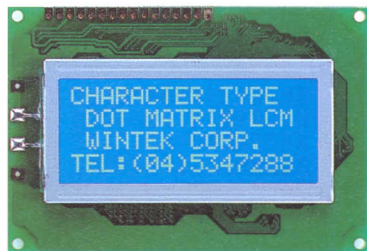
● WM-C1601M-1GLY



● WM-C4002M-1BLY



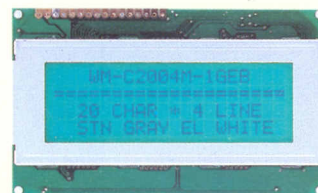
● WM-C2002P-1YLY



● WM-C1604M-1BEW



● WM-C1601M-1YLO



● WM-C2004M-1GEB



● WM-C1601M-1YLY



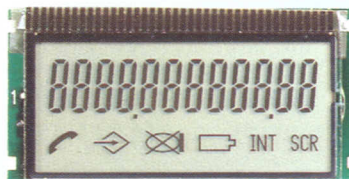
● WM-C2402M-1YLA



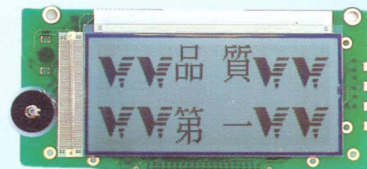
CUSTOMER DESIGN LCM



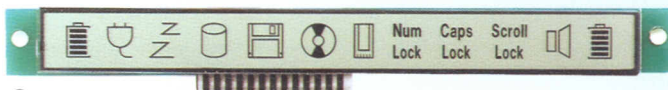
● WD-C1003M-1TNN



● WD-S3603A-1TNN



● WD-G1906A-1WNN



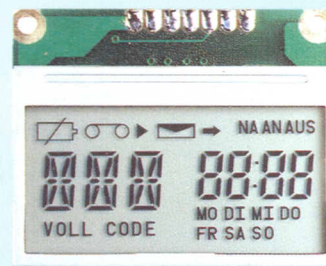
● WD-S1102M-1TNN



● WD-G1203Q-2GEG



● WD-G1212A-1YNN



● WD-S2304M-1TNN

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Introduction

Wintek Corporation is one of the largest liquid crystal display (LCD) manufacturers in the world. Incorporated in Taiwan in 1990, Wintek's principal activities are the design, manufacture and sales of LCDS and LCD modules. Excellent design and superior technology in production provide the most competitive advantage to Wintek's customers.

*Corporate Philosophy

Wintek believes that our corporation continuously creates hopes for an improved future for all who contribute to the company; Thereby, **Wintek** will optimize the achievement of our objectives and will enjoy an everlasting corporate life.

*Customer Focus

1. We strive for excellence in communication and mutual understanding.
2. We welcome suggestions from our customers for improvement.
3. We encourage customers to tell us how we satisfying their needs.
4. We consider every customer a special asset of our company.
5. We interact with our customers before, during, and after satisfying a custom order.

*Quality Policy

Wintek recognizes that each customer requires an unique combination of R & D excellence, total product quality, focused cost improvement, and timely product delivery to engender a feeling of complete satisfaction and assurance of long-term product performance.

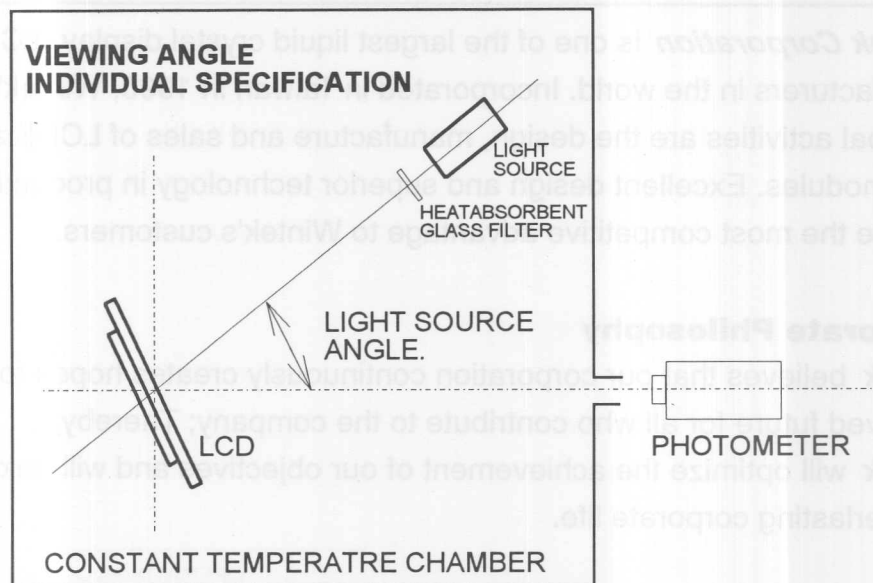
*Quality Accomplishment

ISO-9002 Quality System Certified in September 1994.

ISO-9001 Quality System Certified in May 1995.

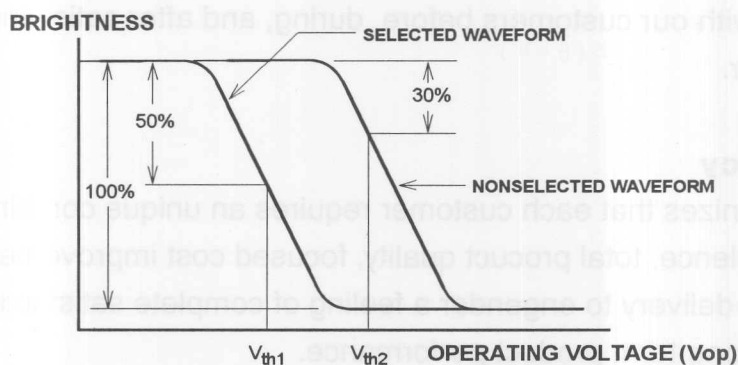


□ OUTLINE OF ELECTRO-OPTICAL CHARACTERISTICS MEASURING SYSTEM :



The segment measured should be one near the center of the effective display area.

□ THRESHOLD VOLTAGE (V_{th1} , V_{th2}) :



Conditions :

- V_{th1} :
- (1) Temperature : See Individual Specification.
 - (2) Viewing Angle (θ) : Minimum value in Individual Specification.
 - (3) Driving Frequency : Maximum value in Individual Specification.
 - (4) Waveform : Selected Waveform.

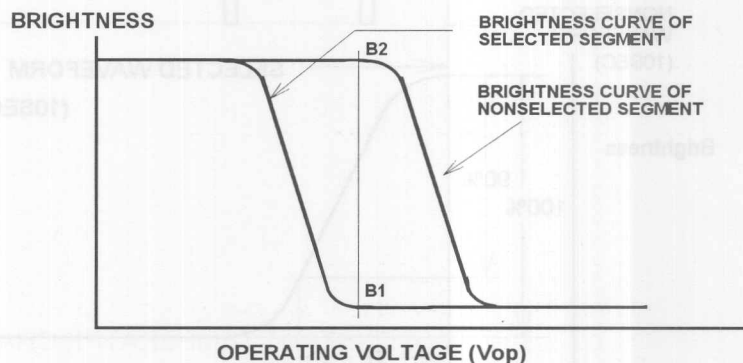
- V_{th2} :
- (1) Temperature : See Individual Specification.
 - (2) Viewing Angle (θ) : Maximum value in Individual Specification.
 - (3) Driving Frequency : Maximum value in Individual Specification.
 - (4) Waveform : Nonselected Waveform.

❑ CONTRAST RATIO (C.R.) :

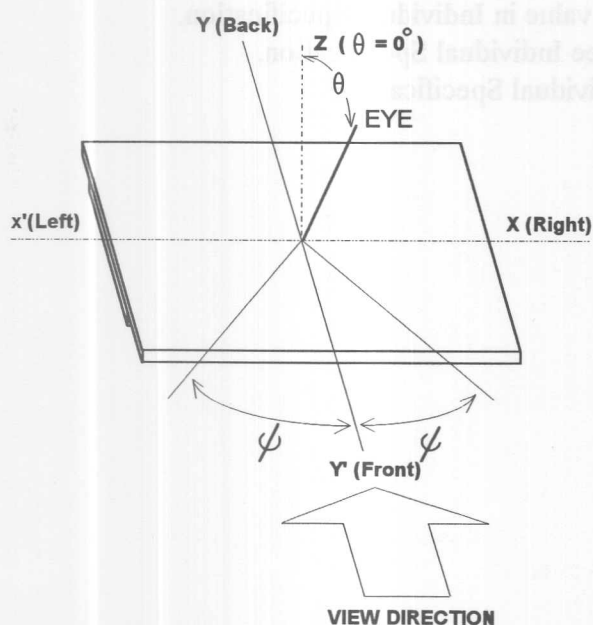
$$\text{CONTRAST RATIO} = \frac{\text{BRIGHTNESS OF NONSELECTED SEGMENT (B2)}}{\text{BRIGHTNESS OF SELECTED SEGMENT (B1)}}$$

Conditions :

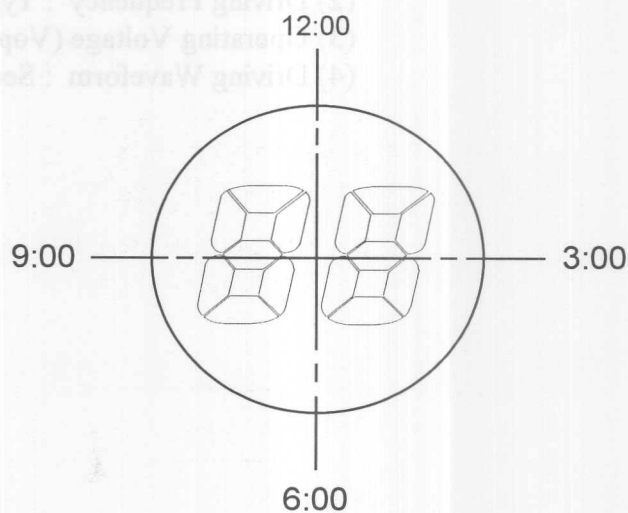
- (1) Temperature : 25°C
- (2) Operating Voltage (Vop) :
Typical value in Individual
Specification .



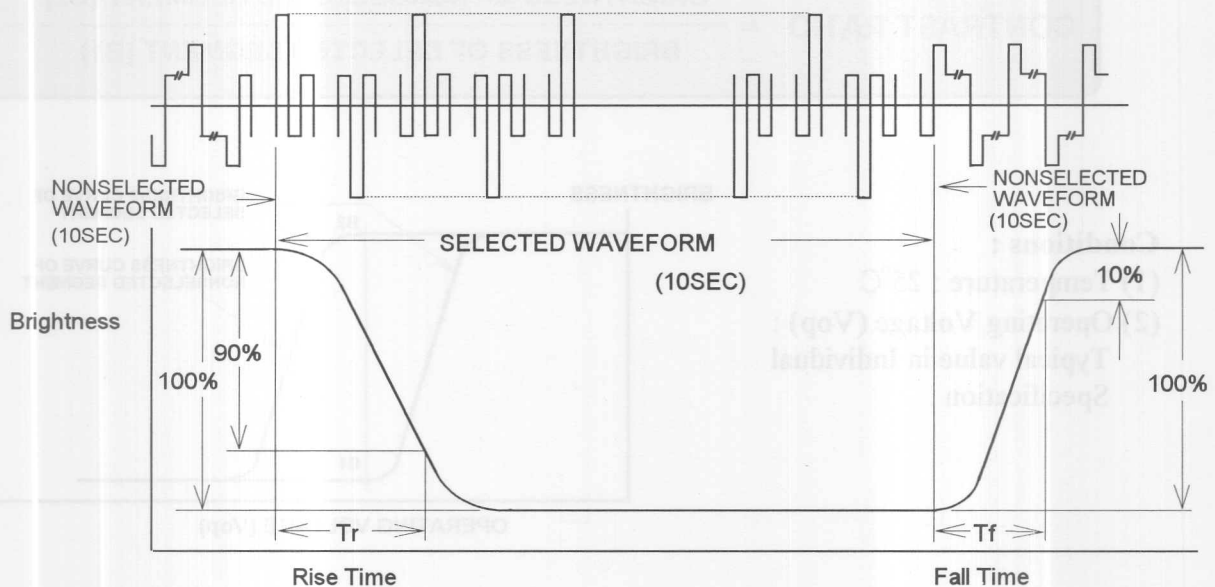
❑ VIEWING ANGLE (θ) :



❑ DEFINITION OF VIEWING DIRECTION



□ RESPONSE TIME (T_r , T_f) :



Conditions :

- (1) Viewing Angle (θ) : Minimum value in Individual Specification.
- (2) Driving Frequency : Typical value in Individual Specification.
- (3) Operating Voltage (V_{op}) : See Individual Specification.
- (4) Driving Waveform : See Individual Specification.

□ DRIVING WAVEFORM :

Vop : Driving voltage

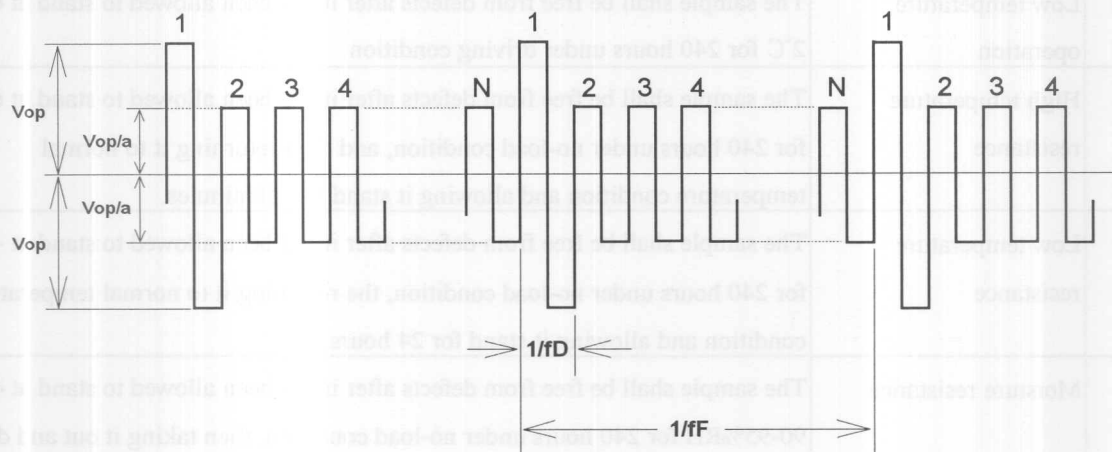
N : Duty

fD : Driving frequency

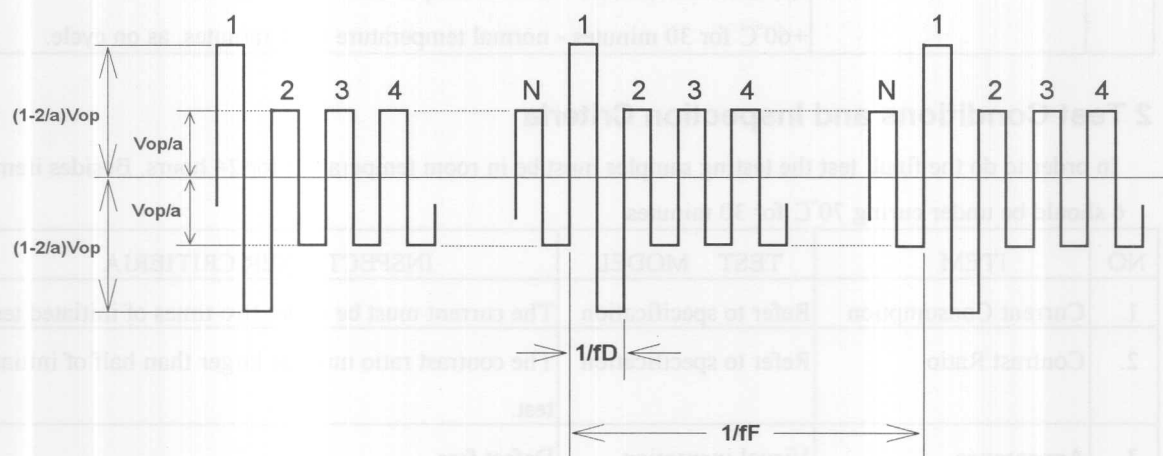
fF : Frame frequency

a : Bias

(a) SELECTED WAVEFORM :



(b) NON-SELECTED WAVEFORM :



1 Standard Specifications for Reliability

1 Standard Specifications for Reliability of General-purpose LCD & LCM

NO	ITEM	DESCRIPTION
1.	High temperature operation	The sample shall be free from defects after it has been allowed to stand at 50°C \pm 2°C for 240 hours under driving condition.
2.	Low temperature operation	The sample shall be free from defects after it has been allowed to stand at 0°C \pm 2°C for 240 hours under driving condition.
3.	High temperature resistance	The sample shall be free from defects after it has been allowed to stand at 60°C for 240 hours under no-load condition, and then returning it to normal temperature condition and allowing it stand for 30 minutes.
4.	Low temperature resistance	The sample shall be free from defects after it has been allowed to stand at -20°C for 240 hours under no-load condition, the returning it to normal temperature condition and allowing it stand for 24 hours.
5.	Moisture resistance	The sample shall be free from defects after it has been allowed to stand at 40°C, 90-95%RH for 240 hours under no-load condition, then taking it out and drying it at normal temperature.
6.	Thermal shock resistance	The sample shall be free from defects when it is subjected to the following 10 cycles of operation: -20°C for 30 minutes - normal temperature for 5 minutes- +60°C for 30 minutes - normal temperature for 5 minutes, as on cycle.

2 Test Conditions and Inspection Criteria

In order to do the final test the testing samples must be in room temperature for 24 hours. Besides item 3, 5, 6 should be under curing 70°C for 30 minutes.

NO	ITEM	TEST MODEL	INSPECTIONER CRITERIA
1.	Current Consumption	Refer to specification	The current must be under two times of initiated test.
2.	Contrast Ratio	Refer to specification	The contrast ratio must be larger than half of initiated test.
3.	Appearance	Visual inspection	Defect free.

3 Life time

Functions, performance, appearance, etc. shall be free from remarkable deterioration with 50,000 hours under ordinary operating and storage conditions room temperture (25°C \pm 10°C), normal humidity (45 \pm 20%RH), and in area not exposed to direct sun light.

2 Standard Specifications for Reliability

1 Standard Specifications for Reliability of Wide - Temperature LCD & LCM

NO	ITEM	DESCRIPTION
1.	High temperature operation	The sample shall be free from defects after it has been allowed to stand at 70°C $\pm 2^\circ\text{C}$ for 500 hours under driving condition.
2.	Low temperature operation	The sample shall be free from defects after it has been allowed to stand at -25°C $\pm 2^\circ\text{C}$ for 500 hours under driving condition.
3.	High temperature resistance	The sample shall be free from defects after it has been allowed to stand at 85°C for 500 hours under no-load condition, and then returning it to normal temperature condition and allowing it stand for 30 minutes.
4.	Low temperature resistance	The sample shall be free from defects after it has been allowed to stand at -40°C for 500 hours under no-load condition, the returning it to normal temperature condition and allowing it stand for 24 hours.
5.	Moisture resistance	The sample shall be free from defects after it has been allowed to stand at 60°C, 90-95%RH for 500 hours under no-load condition, then taking it out and drying it at normal temperature.
6.	Thermal shock resistance	The sample shall be free from defects when it is subjected to the following 20 cycles of operation: -20°C for 30 minutes - normal temperature for 5 minutes- +60°C for 30 minutes - normal temperature for 5 minutes, as on cycle.

2 Test Conditions and Inspection Criteria

In order to do the final test the testing samples must be in room temperature for 24 hours. Besides item 3, 5, 6 should be under curing 70°C for 30 minutes.

NO	ITEM	TEST MODEL	INSPECTIONER CRITERIA
1.	Current Consumption	Refer to specification	The current must be under four times of initiated test.
2.	Contrast Ratio	Refer to specification	The contrast ratio must be larger than half of initiated test.
3.	Appearance	Visual inspection	Defect free.

3 Life time

Functions, performance, appearance, etc. shall be free from remarkable deterioration with 50,000 hours under ordinary operating and storage conditions room temperature ($25^\circ\text{C} \pm 10^\circ\text{C}$), normal humidity ($45 \pm 20\%\text{RH}$), and in area not exposed to direct sun light.

STANDARD LCM PRODUCTS SPEC. LIST

CHARACTER TYPE LCM

Display format char.xline	Model No.	Module Size (WxHxT)mm	Effective Viewing Area (WxH)mm	Character Size (WxH)mm	Dot Size (WxH)mm	Driving Method (duty)	Apporx. weight (g)	Process & Color					Backlight		
								TN	HTN	STN GRAY	STN YELLOW	STN BLUE	NONE	LED	EL
16x1	WM-C1601M	80.0x36.0 x9.5/14.5	64.5x15.0	3.07x6.56	0.55x0.75	1/16	26	○	○	○	○	○	○	○	○
16x1	WM-C1601P	80.0x36.0 x9.5/14.5	64.5x15.0	3.07x6.56	0.55x0.75	1/16	26	○	○	○	○	○	○	○	○
16x1	WM-C1601Q	122.0x33.0 x10.0/14.5	99.0x13.0	4.84x9.66	0.92x1.10	1/16	55	○	○	○	○	○	○	○	○
16x1	WD-C1601T	80.0x36.0 x9.5/14.5	64.5x15.0	3.07x6.56	0.55x0.75	1/16	26	○	○	○	○	○	○	○	○
16x2	WM-C1602K	84.0x44.0 x9.5/14.5	63.0x18.0	2.95x5.55	0.55x0.65	1/16	30	○	○	○	○	○	○	○	○
16x2	WM-C1602M	80.0x36.0 x9.5/14.5	64.5x15.0	2.95x4.35	0.55x0.50	1/16	30	○	○	○	○	○	○	○	○
16x2	WD-C1602M	93.0x50.0 x10.0	72.0x27.0	3.49x7.22	0.65x0.85	1/16	30	○	○	○	○	○	○	○	○
16x2	WM-C1602N	85.0x29.5 x9.5/13.0	62.5x16.5	2.78x4.89	0.50x0.55	1/16	30	○	○	○	○	○	○	○	○
16x2	WM-C1602Q	122.0x44.0 x10.0/14.5	99.0x24.0	4.84x9.66	0.92x1.10	1/16	46	○	○	○	○	○	○	○	○
16x2	WD-C1602Q	122.0x44.0 x10.0/14.5	99.0x24.0	4.84x9.66	0.92x1.10	1/16	46	○	○	○	○	○	○	○	○
16x2	WD-C1602R	85.0x36.0 x9.5/14.5	64.5x15.0	2.95x4.35	0.55x0.50	1/16	40	○	○	○	○	○	○	○	○
16x4	WM-C1604M	87.0x60.0 x9.5/14.5	61.8x25.2	2.95x4.75	0.55x0.55	1/16	50	○	○	○	○	○	○	○	○
20x2	WM-C2002M	116.0x37.0 9.5/14.5	84.0x18.6	3.20x5.55	0.60x0.65	1/16	40	○	○	○	○	○	○	○	○
20x2	WM-C2002P	180.0x40.0 x9.5/14.5	149.0x23.0	6.00x9.66	1.12x1.12	1/16	80	○	○	○	○	○	○	○	○
20x4	WM-C2004M	98.0x60.0 x9.5/14.5	76.0x25.2	2.95x4.75	0.55x0.55	1/16	60	○	○	○	○	○	○	○	○
24x2	WM-C2402M	118.0x36.0 x9.5/14.5	94.5x18.0	3.20x5.55	0.60x0.65	1/16	50	○	○	○	○	○	○	○	○
24x2	WM-C2402P	113.1x36.0 x9.5	94.5x18.0	3.20x5.55	0.60x0.65	1/16	50	○	○	○	○	○	○		
40x2	WM-C4002M	182.0x32.0 x9.5/14.5	154.5x16.5	3.20x5.55	0.60x0.65	1/16	75	○	○	○	○	○	○	○	○
40x4	WM-C4004A	190.0x54.0 x10.5/14.5	147.0x29.5	2.78x4.89	0.50x0.55	1/16	125	○	○	○	○	○	○	○	○

GRAPHIC TYPE LCM

Number of DOTS	Model No.	Module Size (WxHxT)mm	Effective Viewing Area (WxH)mm	Dot Size (WxH)mm	Dot Pitch (WxH)mm	Driving Method (duty)	Apporx. weight (g)	Process & Color					Backlight				BUILT-IN CONTROLLER	NOTE
								HTN	STN	STN	STN	STN	NONE	LED	EL	CCFL		
122x32	WM-G1203Q	84.0x44.0 x10.0/13.0	60.5x18.5	0.4x0.45	0.44x0.49	1/32	30	○	○	○	○	○	○	○			SED1520	Vop=4.6v
128x64	WM-G1206A	93.0x70.0 x8.5/13.5	71.7x39.0	0.48x0.48	0.52x0.52	1/64	65		○	○	○	○	○	○	○		HD61202	Single Power Supply is available
240x64	WM-G2406A	180.0x65.0 x10.0/20.1	134.0x40.0	0.49x0.49	0.53x0.53	1/64	120		○	○	○	○	○	○	○	○	T6963C	
240x64	WM-G2406B	180.0x65.0 x10.0/20.1	134.0x40.0	0.49x0.49	0.53x0.53	1/64	120		○	○	○	○	○	○	○	○	HD61830	
240x128	WM-G2412A	170.0x101.0 x14.0	132.0x76.0	0.47x0.47	0.50x0.50	1/128	180		○	○	○	○	○		○	○	T6963C	
320x240	WM-G3224A	167.0x109.0 x10.0	122.0x92.0	0.33x0.33	0.36x0.36	1/240	240		○	○	○	○	○		○	○		

SEGMENT TYPE LCM

Number of SEGMENTS	Model No.	Module Size (WxHxT)mm	Effective Viewing Area (WxH)mm	Driving Method (duty)	Apporx. weight (g)	Process & Color					Backlight		
						TN	HTN	STN	STN	STN	NONE	LED	EL
114	WD-S3104A	49.0x26.0 x6.6	36.0x14.0	1/4	25	○					○		
117	WD-S3204M	42.2x22.0 x4.8	39.2x12.1	1/4	20	○					○		

Precautions in Use of LCM

1. Handling of LCM

- Do not give external shock.
- Do not apply excessive force on the surface.
- Liquid in LCD is hazardous substance must not lick and swallow when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Do not operate it above the absolute maximum rating.
- Do not disassemble the LCM.
- Avoid contacting oil and fats.

2. ESD Protection

The LCM used the CMOS Ics, electrical-static discharged (ESD) protection is required.

- Store in ESD free environment.
- Ground yourself before handling the LCD module.
- Ground the soldering iron or other tools used during assembly.

3. Storage

- Store in an ambient temperature of 5 to 45°C, and in a relative humidity of 40% to 60%. Do not expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.
- Note that the presence of waterdrops or dew in the LCD panel may deteriorate the polarizer or corrode the electroed.

4. Soldering

- Use the high quality solder.(60-63% tin mixed with lead)
- Iron: no higher than 260°C and less than 3-4 secs during soldering.
- After using the flux, keep in mind to clean the PCB thoroughly.
- Soldering: only to the I/O terminals.
- Rewiring: no more than 3 times.

Using methods of BKL

1. There are five methods of using LED in character type.

- ① This is the most common type to light the LED by external voltage of 4.2V to JP2 between pin 1 and pin 4. And we use this method to light the LED if no other demands.
- ② Lighting the LED through a limiting current resistance which we already included in our LCM by external voltage of 5V to JP2 between pin1 and pin4.
- ③ Providing 4.2V by pin 15 and pin 16 of the interface to light the LED.
- ④ Providing 5V by pin 15 and pin 16 of the interface to light the LED through a limiting current resistance which we already included in our LCM.
- ⑤ We can light the LED only by inner voltage through a limiting resistance without any external power supply.

This is the five types of lighting the LED.

2. The customer can select an suitable backlight type, such as LED, EL, CCFL, for getting a good performance.

3. We accept the customer's design in the BKL lighting methods.

Module Classification Information

W	M	-	C	1	6	0	2	A	-	1	T	L	Y	a
1	2	-	3	4	5	6	7	8	-	9	10	11	12	13

1 ----- Brand:wintek Corp.

2 ----- LCM Type:M:Standard LCM. D:Customer's Design LCM.

3 ----- Display Type:S:Segment. C:Character. G:Graphic.

4-7 --- Display Function:Column and Row of segments/Column and Row of Characters/Column and Row of Dots.

8 ----- Package of Driving Circuit:A-L:SMT. M-U:COB(except"0")
V-Z:COG. 1-9:TAB. 0:other.

9 ----- Temperature Range & View Direction:
General Purpose: 1: 6:00, 2: 12:00, 3: 3:00, 4: 9:00
High Performance:6: 6:00, 7: 12:00, 8: 3:00,9: 9:00.

10 ----- LCD model & background color:
T: TN Natural Color , H:HTN, G:STN Gray, B:STN Blue
Y:STN Yellow, W:FSTN Black/White , 0:OTHER.

11 ----- Backlight Type : N:Without Backlight , L:LED , E:EL
F:CCFL.

12 ----- Backlight Color:N:Without Backlight , Y:Yellow Green,
G:Green , B:Blue, A:Amber, W:White.
R:Red , O: Orange , X:other.

13 ----- Serial Code.

Optical Characteristics

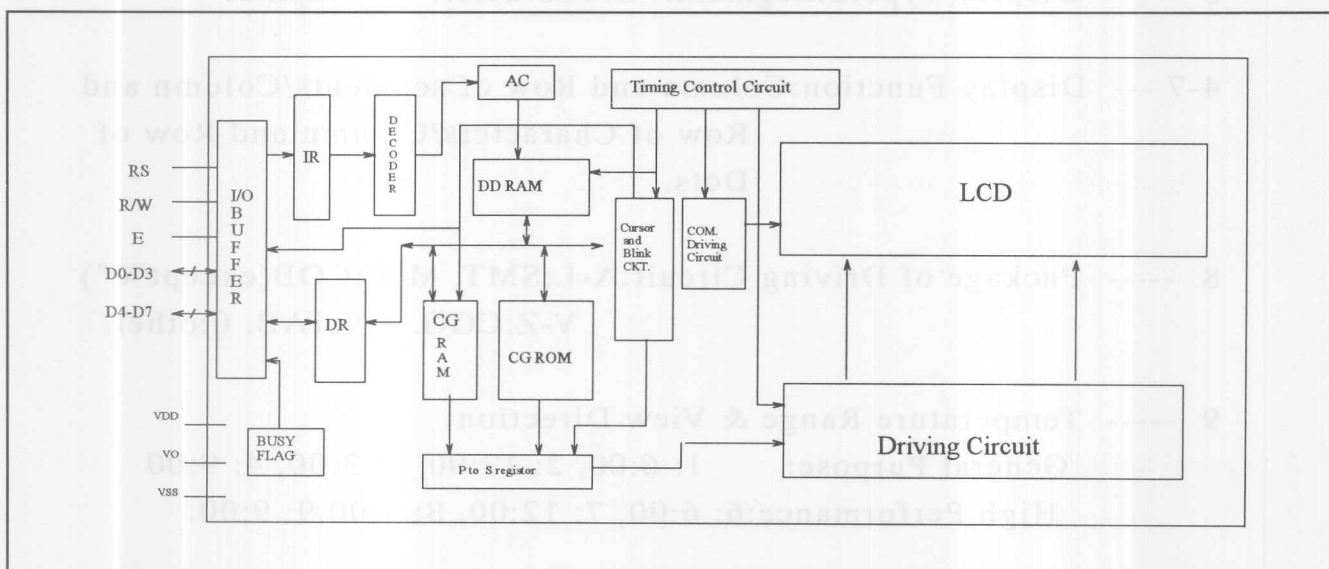
TN TYPE

Item	Sym.	Condition	Min.	Type	Max.	Unit
View Angle(V)	θ	$C_R \geq 2.0$	10	-	30	deg.
View Angle(H)	ϕ	$C_R \geq 2.0$	-30	-	30	deg.
Contrast Ratio	C_R	-	-	3	-	-
Response Time	T_{ON}	-	-	100	150	ms
Response Time	T_{OFF}	-	-	100	150	ms

STN TYPE:

Item	Sym.	Condition	Min.	Type	Max.	Unit
View Angle(V)	θ	$C_R \geq 2.0$	10	-	40	deg.
View Angle(H)	ϕ	$C_R \geq 2.0$	-30	-	30	deg.
Contrast Ratio	C_R	-	-	5	-	-
Response Time	T_{ON}	-	-	200	300	ms
Response Time	T_{OFF}	-	-	200	300	ms

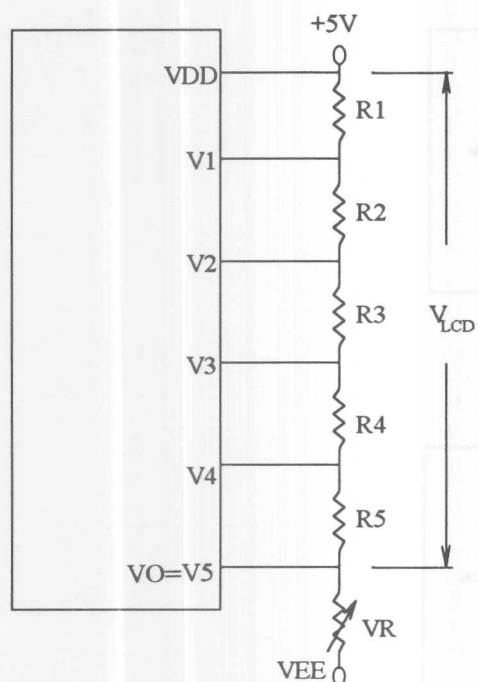
Block Diagram



- Data Register (DR):** DR is a register used for temporary Storage of the date read/write from/into DD RAM and CG RAM.
- Instruction Register (IR):** IR is a register available for storing the instruction codes and address information of display data (DD) RAM and character generator (CG) RAM.
- BUSY FLAG (BF):** When the Busy Flag is "1", it shows that LCM is in internal operation and it can not accept the next instruction.
- Character Generator (CG) ROM:** This ROM generates character pattern from 8-bit character code and provides 192 character patterns.
- Character Generator (CG) RAM:** This RAM allows the user to rewrite the character patterns freely according to the program.
- Address Counter (AC):** This address counter is used to give the address information of DD RAM and CG RAM.
- Display Data (DD) RAM:** This display data RAM is used to store the display data expressed by 8-bit character code. The capacity is 80x8 bits and data for 80 characters can be storage.
- Cursor and Blink Control Circuit:** This circuit generates the cursor and blink.

Power Supply for LCD Module

1. LCD Driving Source (1/5 Bias)



$$V_1 = V_{DD} - \frac{1}{5}V_{LCD}$$

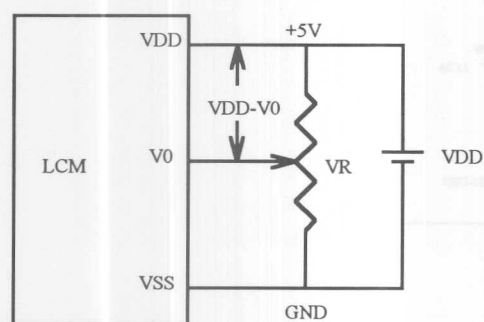
$$V_2 = V_{DD} - \frac{2}{5}V_{LCD}$$

$$V_3 = V_{DD} - \frac{3}{5}V_{LCD}$$

$$V_4 = V_{DD} - \frac{4}{5}V_{LCD}$$

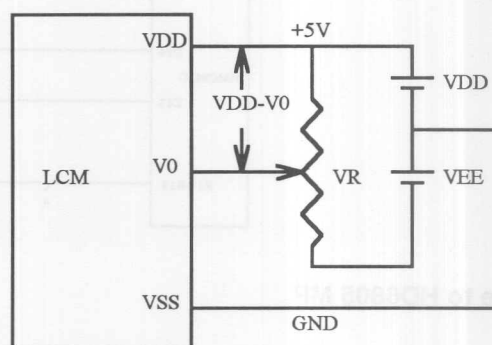
$$V_5 = V_{DD} - V_{LCD}$$

2. Signal Supply Voltage Types



$V_{DD}-V_0$: LCD Driving Voltage
 V_R : 10K - 20K

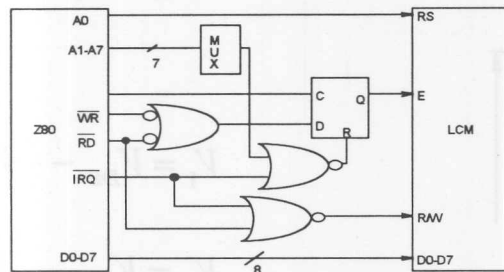
3. Dual Supply Voltage Types



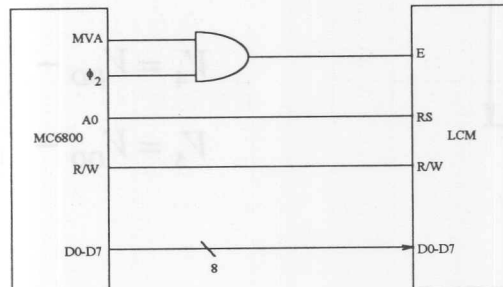
$V_{DD}-V_0$: LCD Driving Voltage
 V_R : 10K - 20K

Interface to MPU

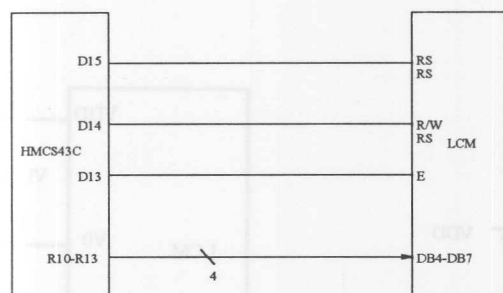
1. Interface to Z-80 CPU



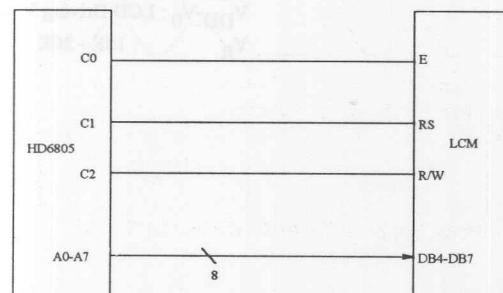
2. Interface to MC6800 CPU



3. Interface to 4-bit CPU (HMCS43C)

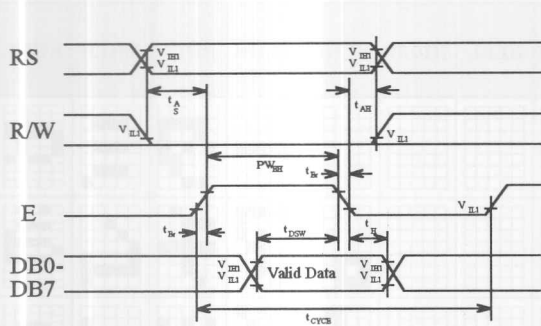


4. Interface to HD6805 MP



Timing Control

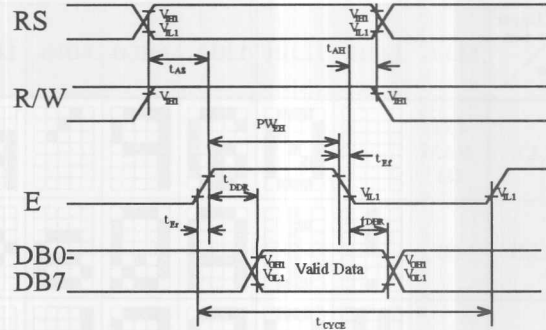
1. Write Operation



(Writing data from MPU to LCM)

Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	t_{CYCE}	666	-	nS
Enable Pulse Width (High level)	PW_{EH}	300	-	nS
Enable Rise/Fall Time	t_{Er}, t_{Ef}	-	25	nS
Address Set-Up Time (RS, R/W, E)	t_{AS}	100	-	nS
Address Hole Time	t_{AH}	10	-	nS
Data Set-Up Time	t_{DSW}	100	-	nS
Data Hold Time	t_H	10	-	nS

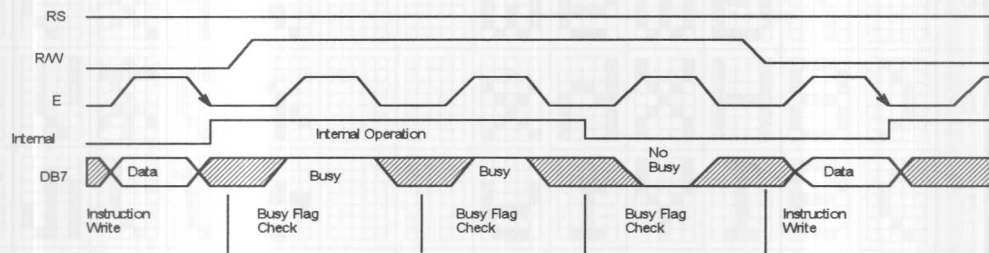
2. Read Operation



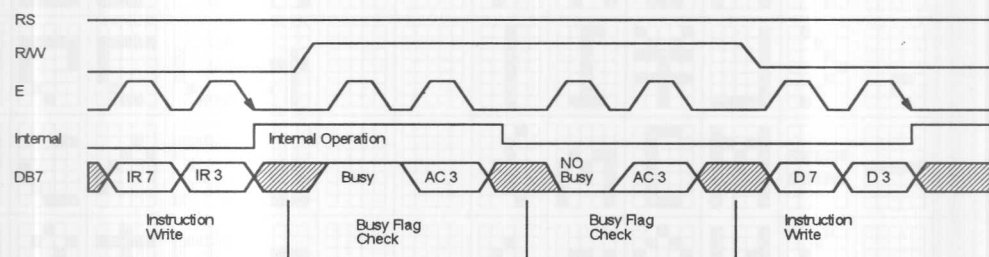
(Reading data from LCM to MPU)

Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	t_{CYCE}	666	-	nS
Enable Pulse Width (High level)	PW_{EH}	300	-	nS
Enable Rise/Fall Time	t_{Er}, t_{Ef}	-	25	nS
Address Set-Up Time (RS, R/W, E)	t_{AS}	100	-	nS
Address Hole Time	t_{AH}	10	-	nS
Data Delay Time	t_{DDR}	-	190	nS
Data Hold Time	t_{DHR}	20	-	nS

3. 8-bit busy flag check timing



4. 4-bit busy check timing



(Note) IR 7, IR 3: Instruction 7th bit, 3rd bit; AC3: Address Counter 3rd bit

Character Generator Rom Map (OA)

Upper 4bit Lower 4bit		LLLL	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	(2)															
LLHL	(3)															
LLHH	(4)															
LHLL	(5)															
LHLH	(6)															
LHHL	(7)															
LHHH	(8)															
HLLL	(1)															
HLLH	(2)															
HLHL	(3)															
HLHH	(4)															
HHLL	(5)															
HHLH	(6)															
HHHL	(7)															
HHHH	(8)															

Character Generator ROM Map (OB)

Upper 4bit Lower 4bit		LLLL	LLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHHL	HHHH
LLLL	CG RAM (1)															
LLH	(2)															
LLHL	(3)															
LLHH	(4)															
LHLL	(5)															
LHLH	(6)															
LHHL	(7)															
LHHH	(8)															
HLLL	(1)															
HLLH	(2)															
HLHL	(3)															
HLHH	(4)															
HHLL	(5)															
HHLH	(6)															
HHHL	(7)															
HHHH	(8)															

User Font Patterns (CG RAM Character)

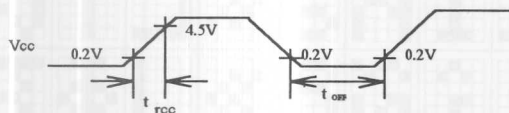
Character Code (DD RAM Data)	CG RAM Address	Character Pattern (CG RAM Data)
7 6 5 4 3 2 1 0 ← Hi LO →	5 4 3 2 1 0	7 6 5 4 3 2 1 0 ← Hi LO →
0000x000	000	xxx ↑ 000 001 010 011 100 101 110 111 xxx ↓
0000x001	001	xxx ↑ 000 001 010 011 100 101 110 111 xxx ↓
0000x111	111	000 001 101 110 111 xxx ↓

← Cursor Position

Initialization of LCM

The LCM automatically initializes (reset) when power is turned on using the internal reset circuit. If the power supply conditions for correctly operating of the internal reset circuit are not met, initialization by instruction is required. Use the procedure in next page for initialization.

Valid Power Supply Condition

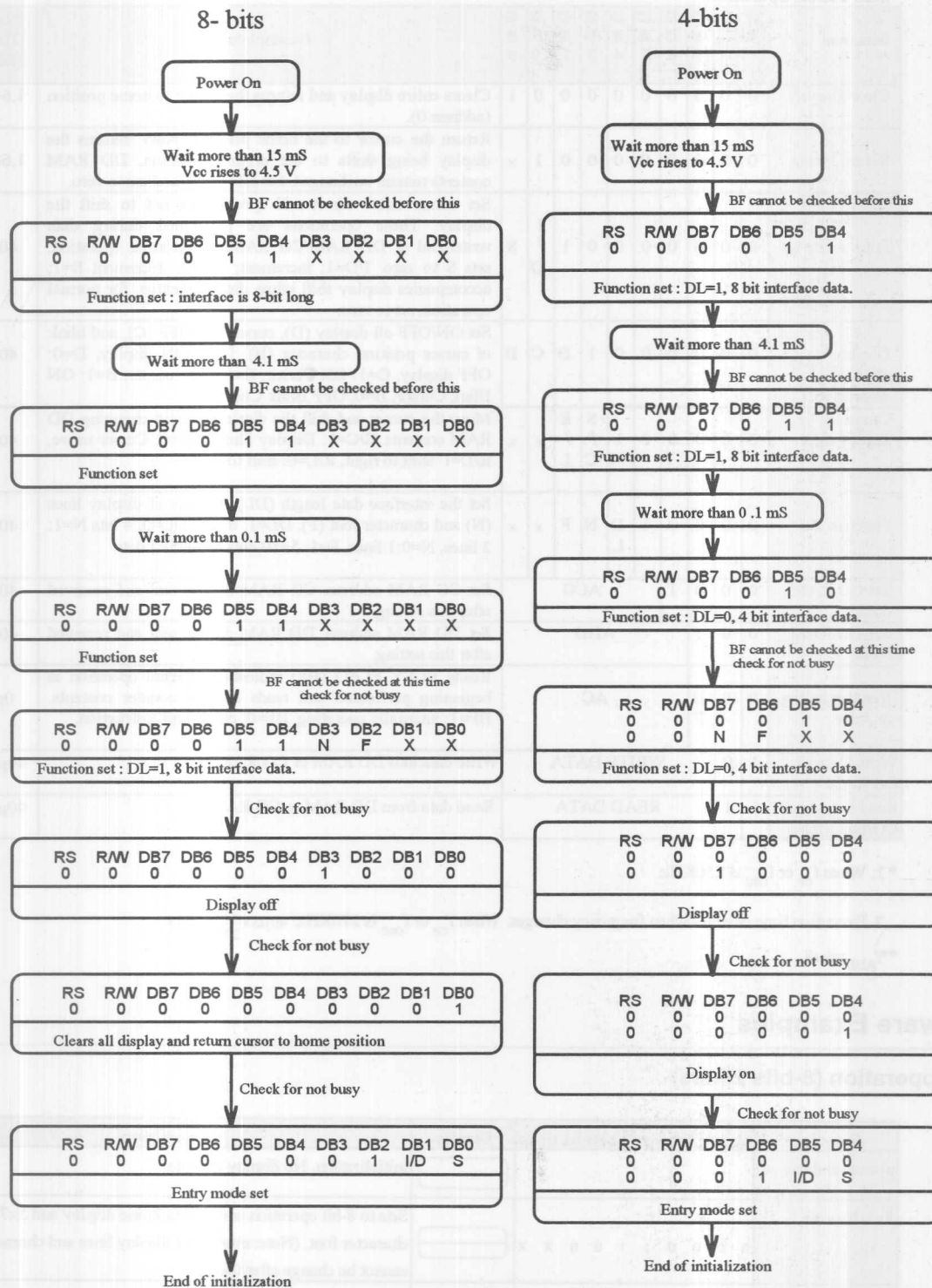


(Not1) $0.1 \text{ ms} \geq t_{\text{rcc}} \geq 10 \text{ ms}$, $t_{\text{off}} \geq 1 \text{ ms}$

(Note 2) t_{off} stipulates the time of power OFF for momentary power supply dip or when power supply cycles ON and OFF.

Item	Sym	Test condition	limit (Min.)	limit (Max.)	Unit
Power supply rise time	t_{rcc}	-	0.1	10	ms
Power supply OFF time	t_{off}	-	1	-	ms

Initialization by Instruction



Instruction Set

Instruction operation

Instruction operation											Description	Execu. Time* (Max.)
Function	R S	R / W	D B 7	D B 6	D B 5	D B 4	D B 3	D B 2	D B 1	D B 0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display and returns the cursor to home position (address 0).	1.64mS
Return Home	0	0	0	0	0	0	0	0	1	x	Return the cursor to the home position. Also returns the display being shifts to the original position. DD RAM contents remain unchanged. Set DD RAM address to zero.	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I / D	S	Set cursor move direct and specifies or not to shift the display. These operations are performed during data write/read of DD RAM/CG RAM. For normal operation, sets S to zero. I/D=1; increment; I/D=0; decrement S=1; accompanies display shift when data is written. for normal operation, set to zero.	40μS
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	Set ON/OFF all display (D), cursor ON/OFF (C), and blink of cursor position character (B). D=1: ON display, D=0: OFF display. C=1: ON Cursor, C=0: OFF cursor, B=1: ON Blink Cursor, B=0, OFF Blink Cursor	40μS
Cursor or display shift	0	0	0	0	0	1	S / C	R / L	x	x	Move the cursor and shift the display without changing DD RAM contents. S/C=1: Display Shift, S/C=0: Cursor move, R/L=1: shift to right, R/L=0: shift to left.	40μS
Function Set	0	0	0	0	1	D L	N	F	x	x	Set the interface data length (DL), number of display lines (N) and character font (F). DL=1: 8 bits, DL=0: 4 bits N=1: 2 lines, N=0:1 lines, F=1: 5×10 dots, F=0: 5×7 dots	40μS
Set CG RAM Addr.	0	0	0	1	ACG						Set CG RAM address. CG RAM data is sent and received after this setting.	40μS
Set DD RAM Addr.	0	0	1	ADD						Set DD RAM address. DD RAM data is sent and received after this setting.	40μS	
Read busy flag & Addr	0	0	B F	AC						Reads BUSY FLAG (BF) indicating internal operation is beginning performed and reads address counter contents. BF=1: internally operating. BF=0: can accept instruction.	0μS	
Write Data to CG RAM	1	0	WRITE DATA						Write data into DD RAM or CG RAM.			40μS**
Read Data from CG/DD RAM	1	1	READ DATA						Read data from DD RAM or CG RAM			40μS**

* 1. When f_{CP} or f_{OSC} is 250KHz.

2. Execution time changes when frequency changes. When f_{CP} or f_{OSC} is 270KHz: $40\mu S \times \frac{250}{270} = 37\mu S$

** $t_{ADD} = 6\mu S$

Software Examples

8-bit operation (8-bits 2lines)

Function	RS	RW	D7	D6	D5	D4	D3	D2	D1	D0	Display	Description		
power on delay												Initialization. No display appears.		
Function set			0	0	0	0	1	1	0	0	x x		Sets to 8-bit operation and selects 2-line display and 5x7 dots character font. (Note: number of display lines and character fonts cannot be change after this.)	
Display OFF			0	0	0	0	0	0	1	0	0	0		Turn off display.
Display ON			0	0	0	0	0	0	1	1	1	0		Turn on display and cursor.
Entry Mode Set			0	0	0	0	0	0	0	1	1	0		Set mode to increment the address by one and to shift the cursor to the right, at the time of write, to the DD/CG RAM Display is not shifted.

Write data to CG/DD RAM	1 0 0 1 0 1 0 1 1 1	W	Write "W". Cursor incremented by one and shift to right
Write data to CG/DD RAM	1 0 0 1 0 0 1 0 0 1	W I	Write "I". Cursor incremented by one and shift to right
Write data to CG/DD RAM	.	W I N T E K	Write "N", "T", "E", and "K".
Set DD address.	0 0 1 1 0 0 0 0 0 0	W I N T E K	Set RAM address so that the cursor is propositioned at the head of the second line.
Write data to CG/DD RAM	.	W I N T E K C R	Write "C", and "R".
Cursor or display shift	0 0 0 0 0 1 0 0 x x	W I N T E K C R	Shift only the cursor position to the left.
Write data to CG/DD RAM	.	W I N T E K C O R P O R A T	Write "O", "R", "P", "O", "R", "A", and "T".
Entry Mode Set	0 0 0 0 0 0 0 1 1 1	W I N T E K C O R P O R A T	Set display mode shift at the time during writing operation.
Write data to CG/DD RAM	1 0 0 1 0 0 1 0 0 1	I N T E K C O R P O R A T I	Write "I". Cursor incremented by one and shift to right. (The display move to left)
Write data to CG/DD RAM	.		Write other characters.
Return Home	0 0 0 0 0 0 0 0 1 0	W I N T E K C O R P O R A T I O	Return both display and cursor to the original position (Set address to zero.

4-bit operation (4-bits 1 line)

Function	RS RW D7 D6 D5	Display	Description
power on delay			Initialization. No display appears.
Function set	0 0 0 0 1 0		Sets to 4-bit operation. In this case, operation is handled as 8-bits by initialization, and only this instruction completes with one write.
Function set	0 0 0 0 1 0 0 0 0 0 x x		Sets 4-bit operation and selects 1-line display and 5x7 dot character font on and resetting is needed. (number of display lines and character fonts cannot be changed hence after.)
Display ON/OFF Control	0 0 0 0 0 0 0 0 1 1 1 0		Turn on display and cursor.
Entry Mode Set	0 0 0 0 0 0 0 0 0 1 1 0		Set mode to increment the address by one and to shift the cursor to the right, at the time of write, to the DD/CG RAM display is not shifted.
Write data to CG/DD RAM	1 0 0 1 0 1 1 0 0 1 1 1	W	Write "W". Cursor incremented by one and shift to right
Same as 8-bit operation			

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

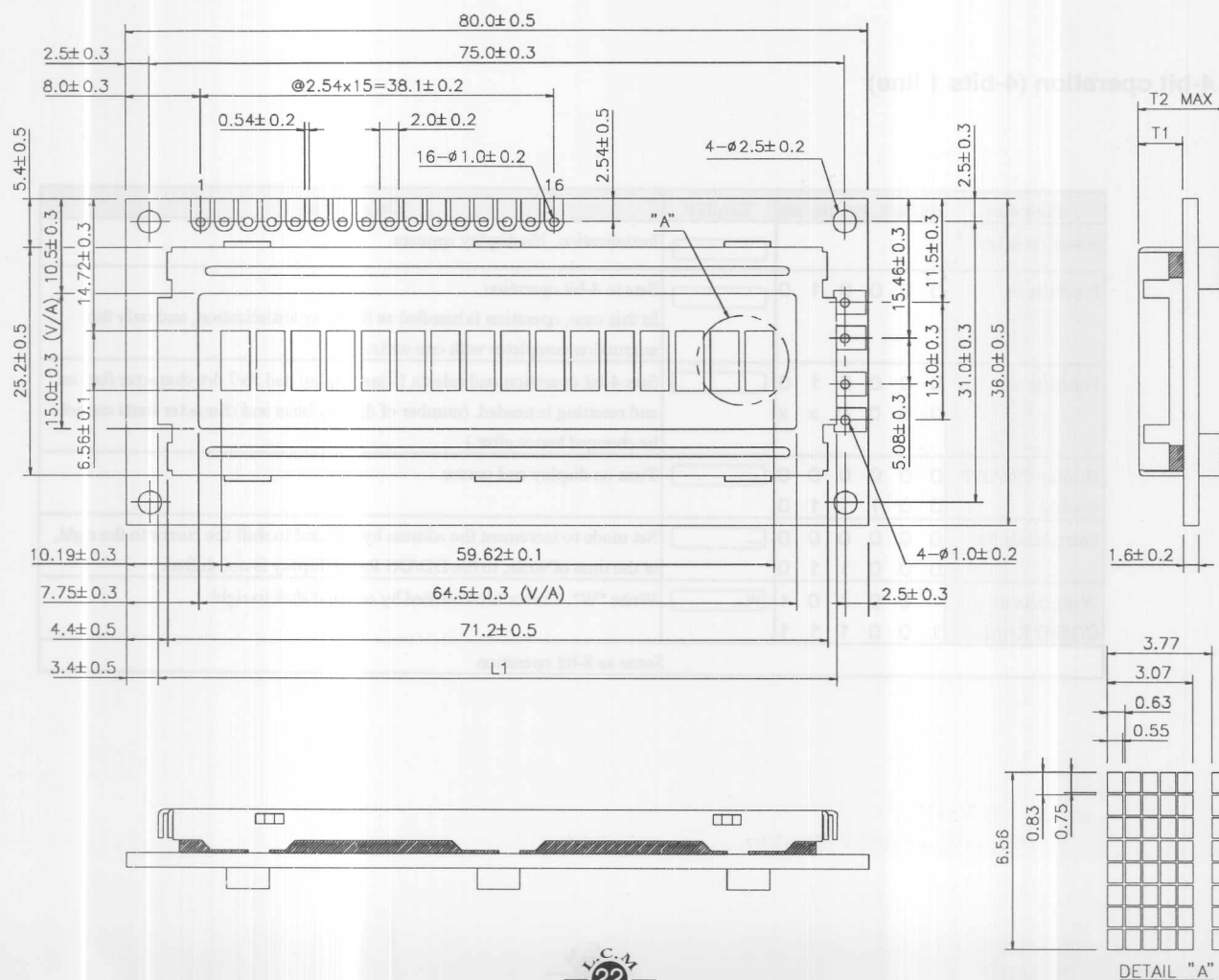
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _i	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{HI}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	1.6	2.5	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _i	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.8	9.5	73.2	mm
LED Backlight	9.3	14.5	71.2	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

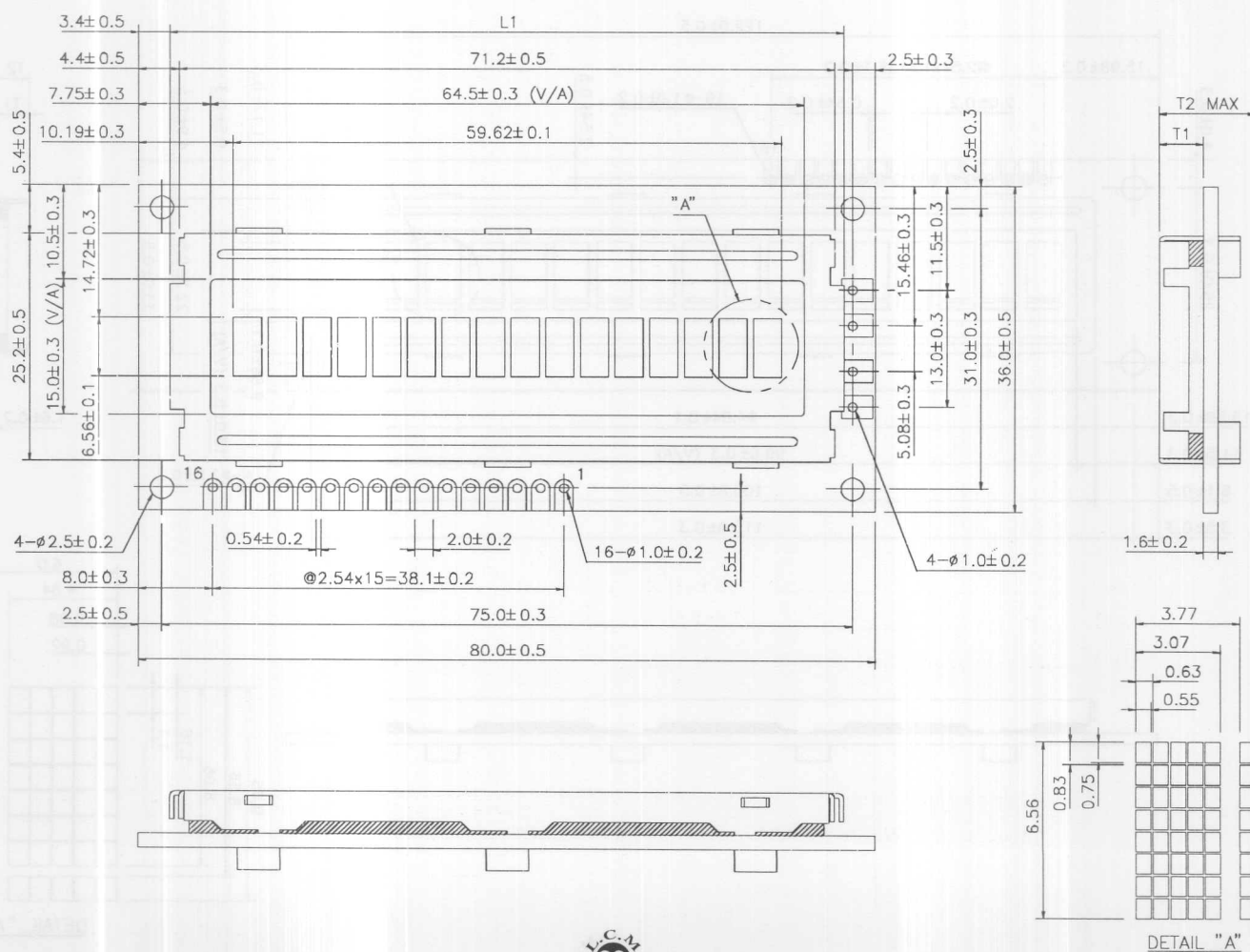
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	—	GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}	—	VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀	—	CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H, H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	1.6	2.5	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.8	9.5	73.2	mm
LED Backlight	9.3	14.5	71.2	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

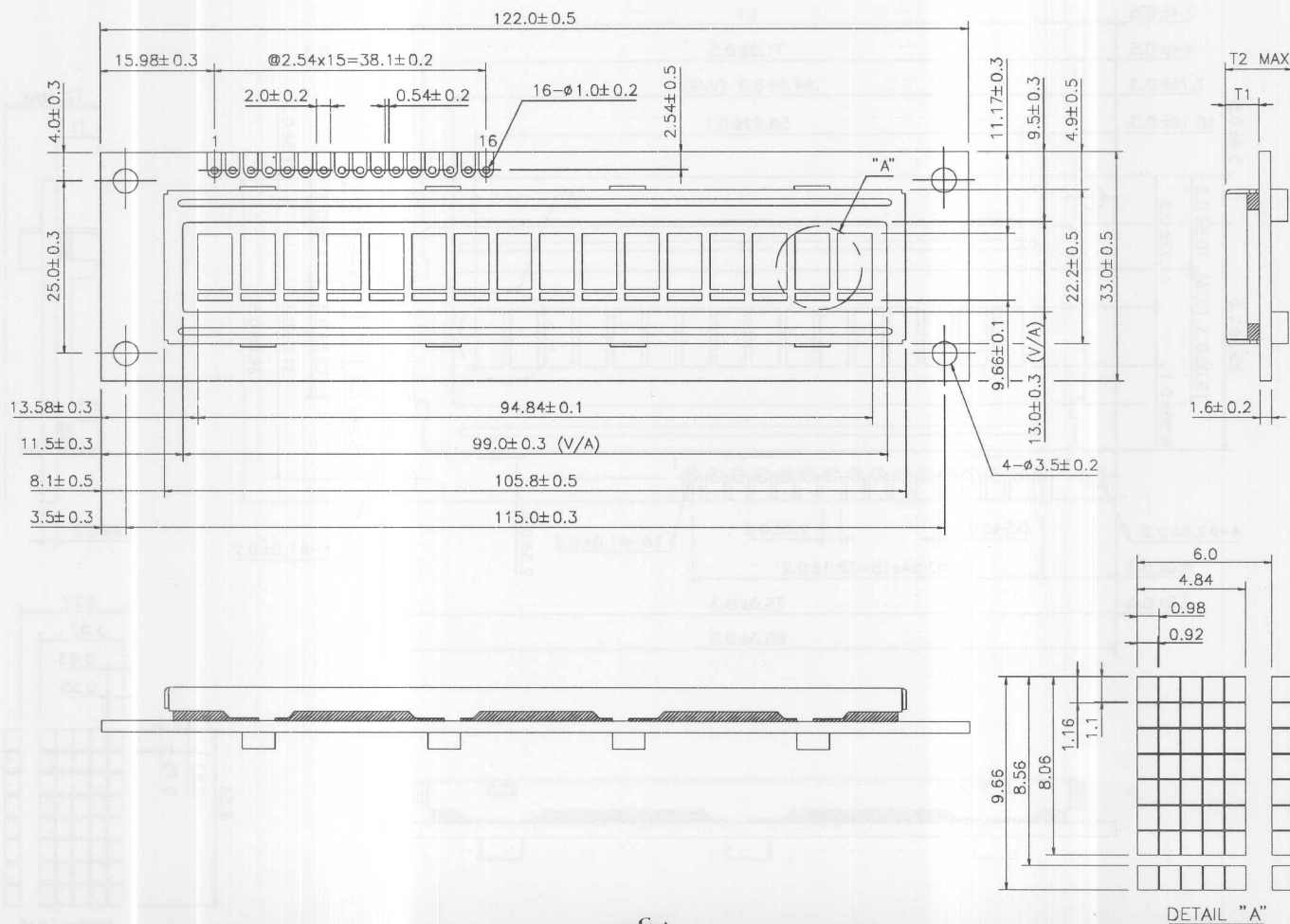
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(OV)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V _b		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H, H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V _b	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V _b	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	—	GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}	—	VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀	—	CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	1.6	2.5	mA

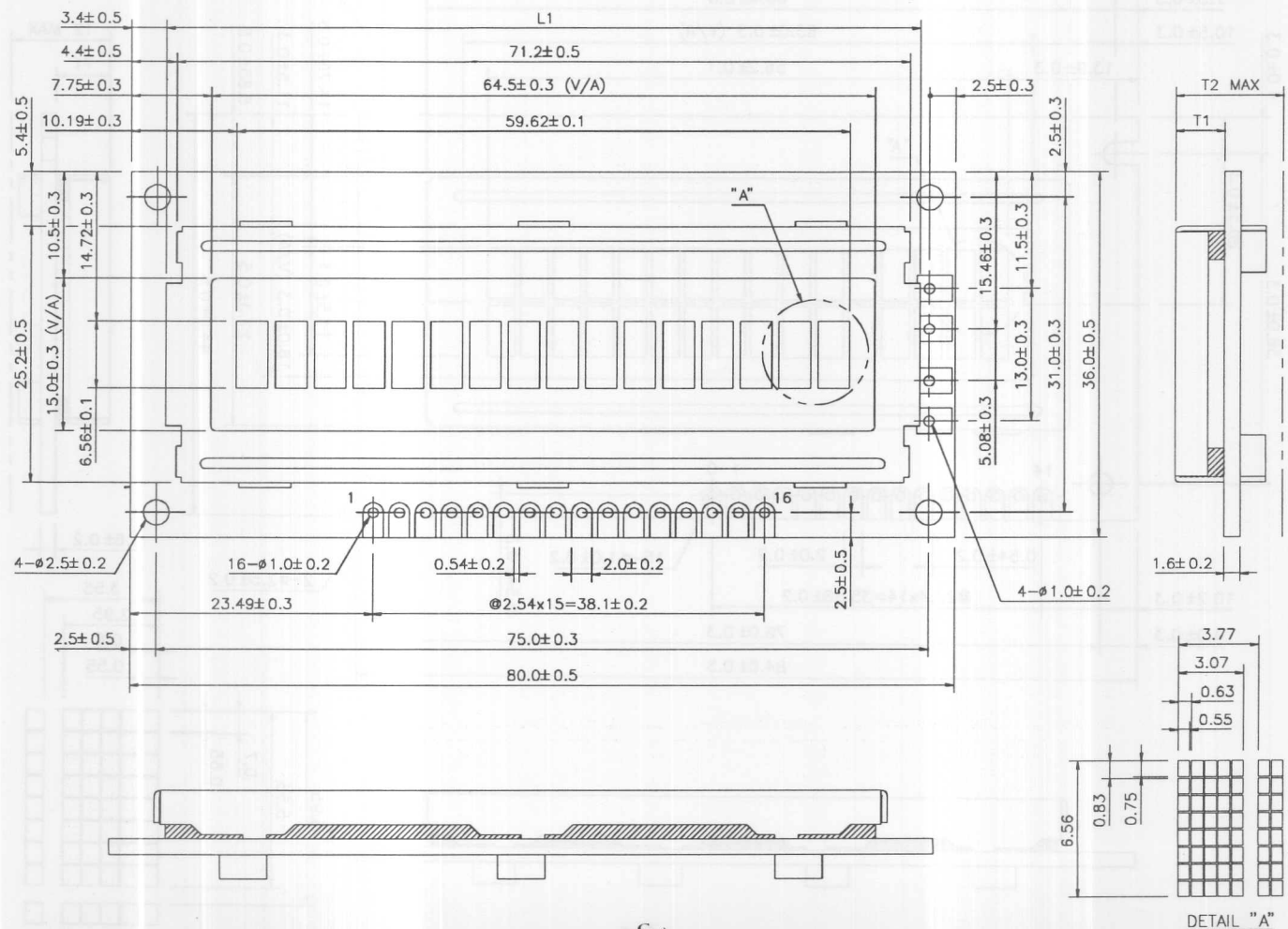
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.8	9.5	73.2	mm
LED Backlight	9.3	14.5	71.2	mm

OUTLINE DIMENSION:



WM-C1602K

16x2 Characters

SPECIFICATIONS FOR CHARACTER TYPE LCM

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

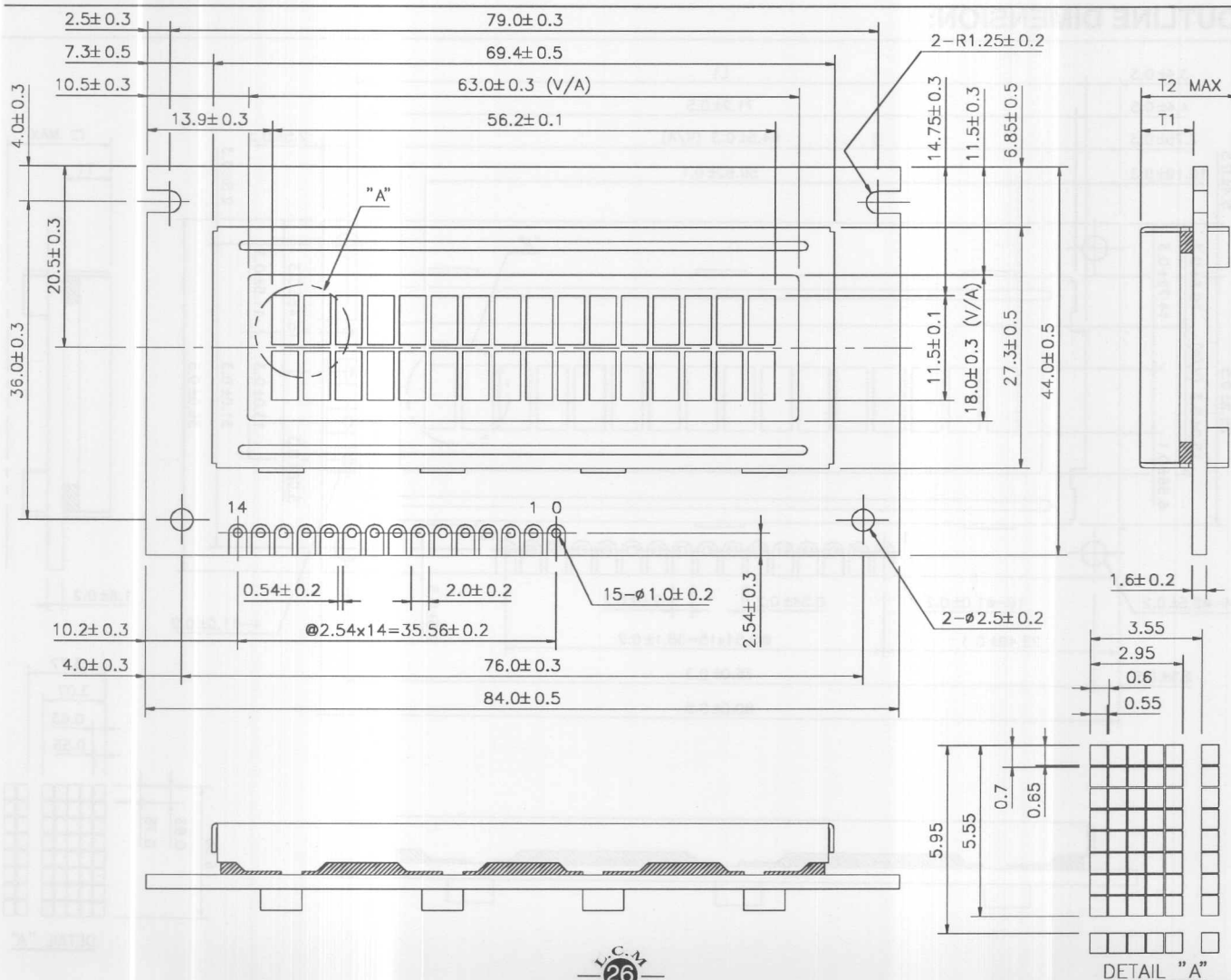
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
0	LED(-)	_____	LED(OV)	8	DB1	H/L	DATA BIT 1
1	V _{SS}	_____	GND(OV)	9	DB2	H/L	DATA BIT 2
2	V _{DD}	_____	V _{CC} (+5V±5%)	10	DB3	H/L	DATA BIT 3
3	V ₀	_____	CONTRAST ARJ.	11	DB4	H/L	DATA BIT 4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT 5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT 6
6	E	H _H →L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT 7
7	DB0	H/L	DATA BIT0				

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	$T_a = 0^{\circ}\text{C}$	----	4.8	----	V
		$T_a = 25^{\circ}\text{C}$	----	4.5	----	V
		$T_a = 50^{\circ}\text{C}$	----	4.2	----	V
INPUT VOLTAGE	V_i	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V_{IH}	----	2.2	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL	V_{OH}	----	2.4	----	----	V
OUTPUT LOW VOL	V_{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I_{DD}	$V_{DD}=5V$	----	1.5	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V _b		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _i	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{HI}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	3.0	mA

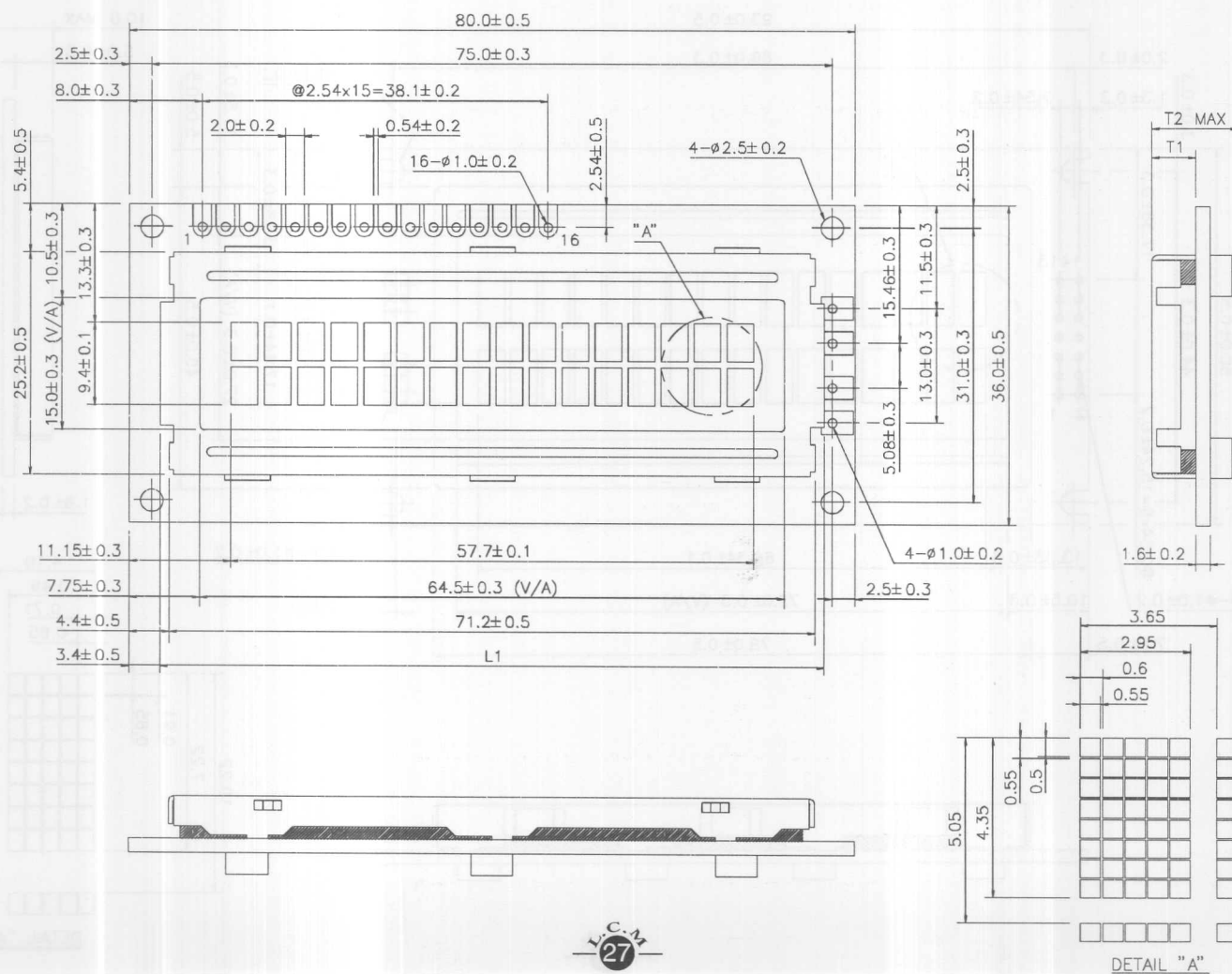
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _i	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.8	9.5	73.2	mm
LED Backlight	9.3	14.5	71.2	mm

OUTLINE DIMENSION:



16x2 Characters

FEATURE:

- ### INTERFACE PIN CONNECTIONS:

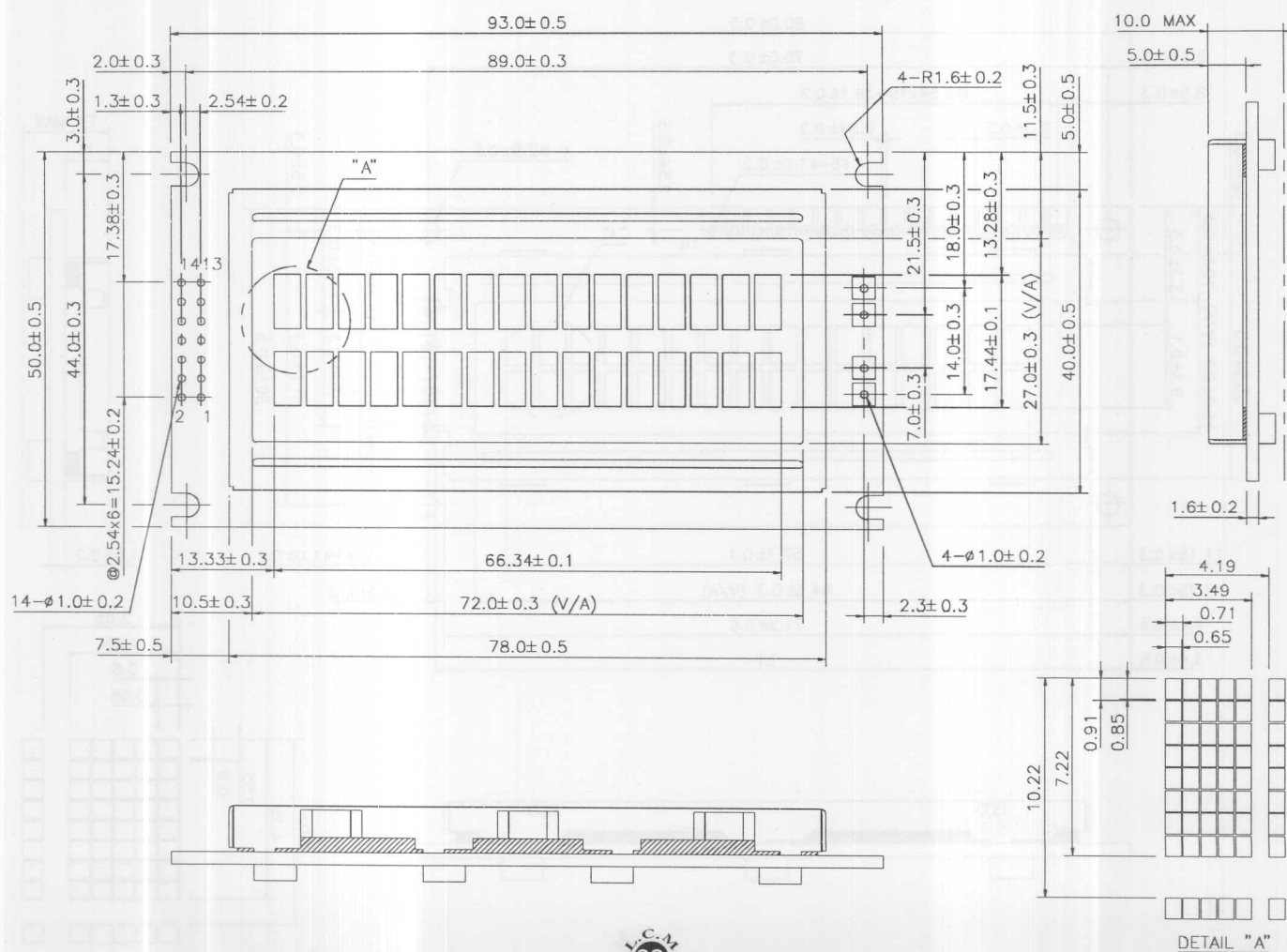
NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{DD}	_____	VCC(+5V±5%)	8	DB1	H/L	DATA BIT1
2	V _{SS}	_____	GND(OV)	9	DB2	H/L	DATA BIT2
3	V ₀	_____	CONTRAST ADJ.	10	DB3	H/L	DATA BIT3
4	RS	H/L	REGISTER SELECT	11	DB4	H/L	DATA BIT4
5	R/W	H/L	READ/WRITE	12	DB5	H/L	DATA BIT5
6	E	H,H→L	ENABLE SIGNAL	13	DB6	H/L	DATA BIT6
7	DB0	H/L	DATA BIT0	14	DB7	H/L	DATA BIT7

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	$T_a = 0^{\circ}\text{C}$ $T_a = 25^{\circ}\text{C}$ $T_a = 50^{\circ}\text{C}$	----	4.8 4.5 4.2	----	V V V
INPUT VOLTAGE	V_i	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V_{IH}	----	2.2	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL	V_{OH}	----	2.4	----	----	V
OUTPUT LOW VOL	V_{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I_{DD}	$V_{DD}=5V$	----	2.0	3.0	mA

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V _O	0	---	6.5	V

OUTLINE DIMENSION:



FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

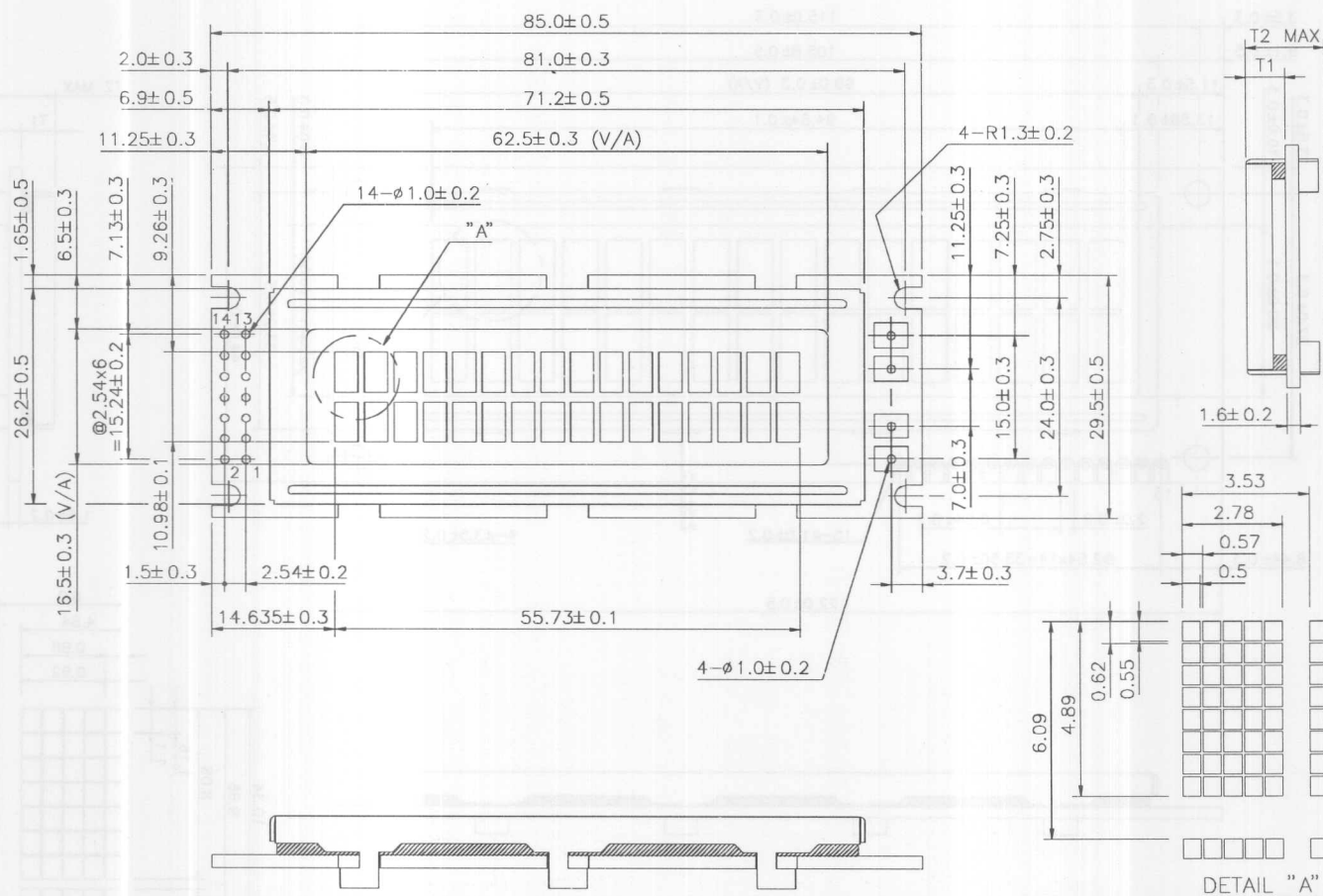
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{cc}	—	VCC(+5V±5%)	8	DB1	H/L	DATA BIT1
2	V _{ss}	—	GND(OV)	9	DB2	H/L	DATA BIT2
3	V ₀	—	CONTRAST ADJ.	10	DB3	H/L	DATA BIT3
4	RS	H/L	REGISTER SELECT	11	DB4	H/L	DATA BIT4
5	R/W	H/L	READ/WRITE	12	DB5	H/L	DATA BIT5
6	E	H,H→L	ENABLE SIGNAL	13	DB6	H/L	DATA BIT6
7	DB0	H/L	DATA BIT0	14	DB7	H/L	DATA BIT7

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	7.8	13.0	mm

WM-C1602Q

16x2 Characters

SPECIFICATIONS FOR CHARACTER TYPE LCM

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

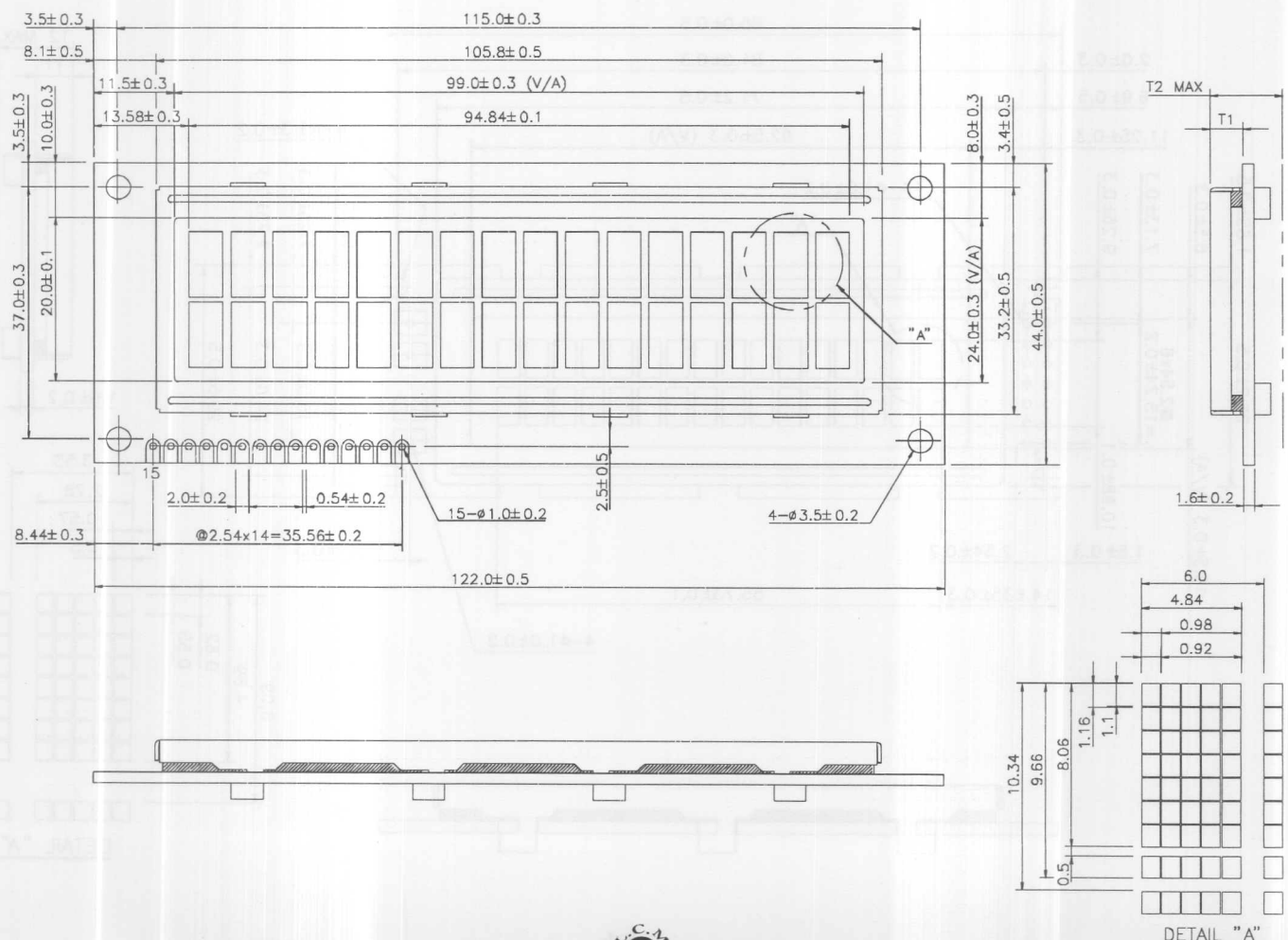
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	—	GND(OV)	9	DB2	H/L	DATA BIT2
2	V _{DD}	—	VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀	—	CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1				

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm

WD-C1602R

16x2 Characters

SPECIFICATIONS FOR CHARACTER TYPE LCM

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

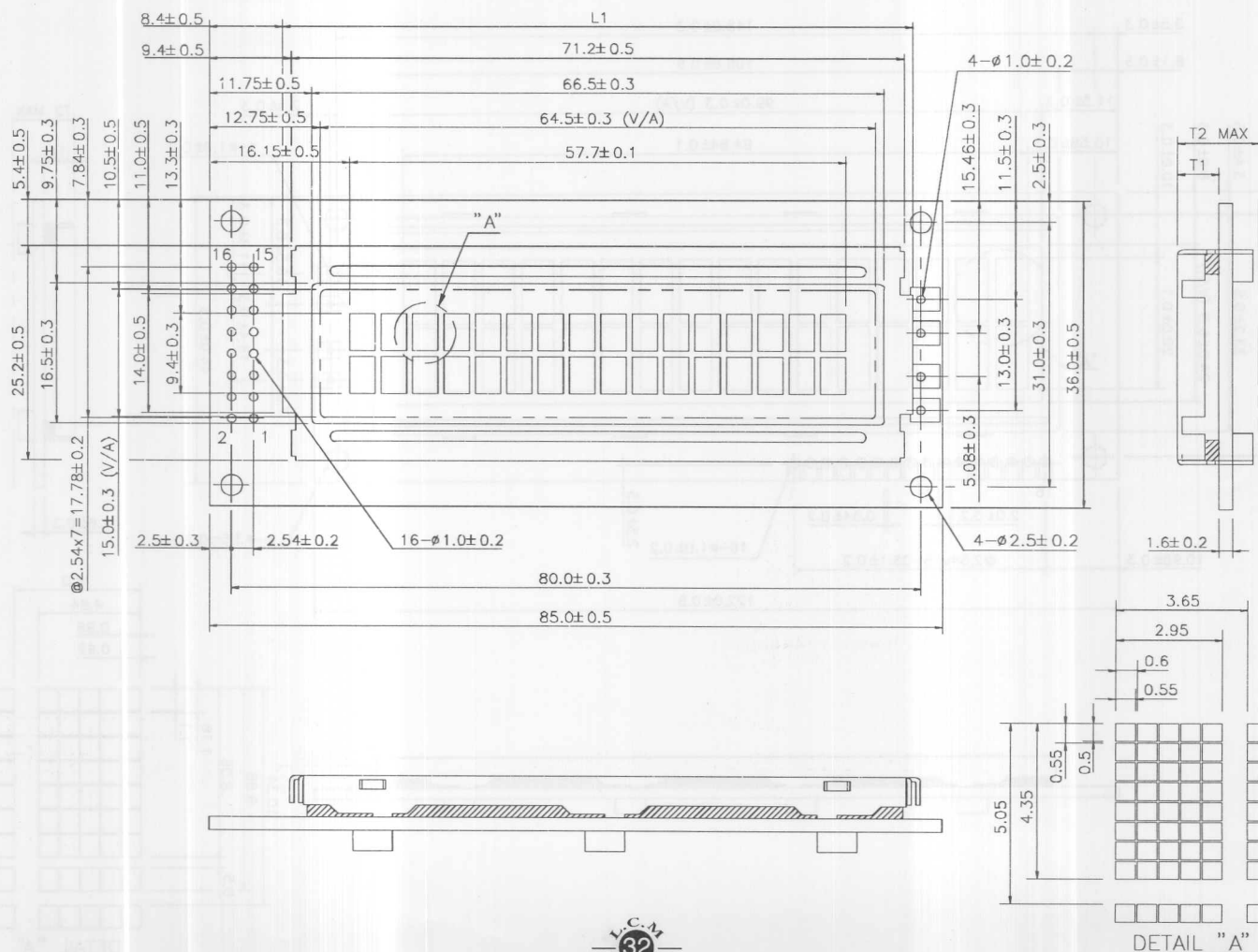
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(OV)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _I	0	---	+50	°C
STORAGE TEMPERATURE	T _{OP}	-20	---	+70	°C
INPUT VOLTAGE	V _{SI}	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.8	9.5	73.2	mm
LED Backlight	9.3	14.5	71.2	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (KS0070)
3. +5V Power Supply
4. 1/16 Duty Cycle
5. Chip On Glass

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	VSS		GND(0V)	9	RS	H/L	REGISTER SELECT SIGNAL
2	OSC2	H/L	OSCILLATION OUTPUT	10	R/W	H/L	READ/WRITE SELECTION
3	OSC1	H/L	OSCILLATION INPUT	11	E	H,H→L	ENABLE SIGNAL
4	V1		BIAS VOLTAGE FOR LCD DRIVING 1	12	VDD		VCC(+5V)
5	V2		BIAS VOLTAGE FOR LCD DRIVING 2	13	DB 4	H/L	DATABIT 4
6	V3		BIAS VOLTAGE FOR LCD DRIVING 3	14	DB 5	H/L	DATABIT 5
7	V4		BIAS VOLTAGE FOR LCD DRIVING 4	15	DB 6	H/L	DATABIT 6
8	V0		CONTRAST ADJUSTMENT	16	DB 7	H/L	DATABIT 7

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

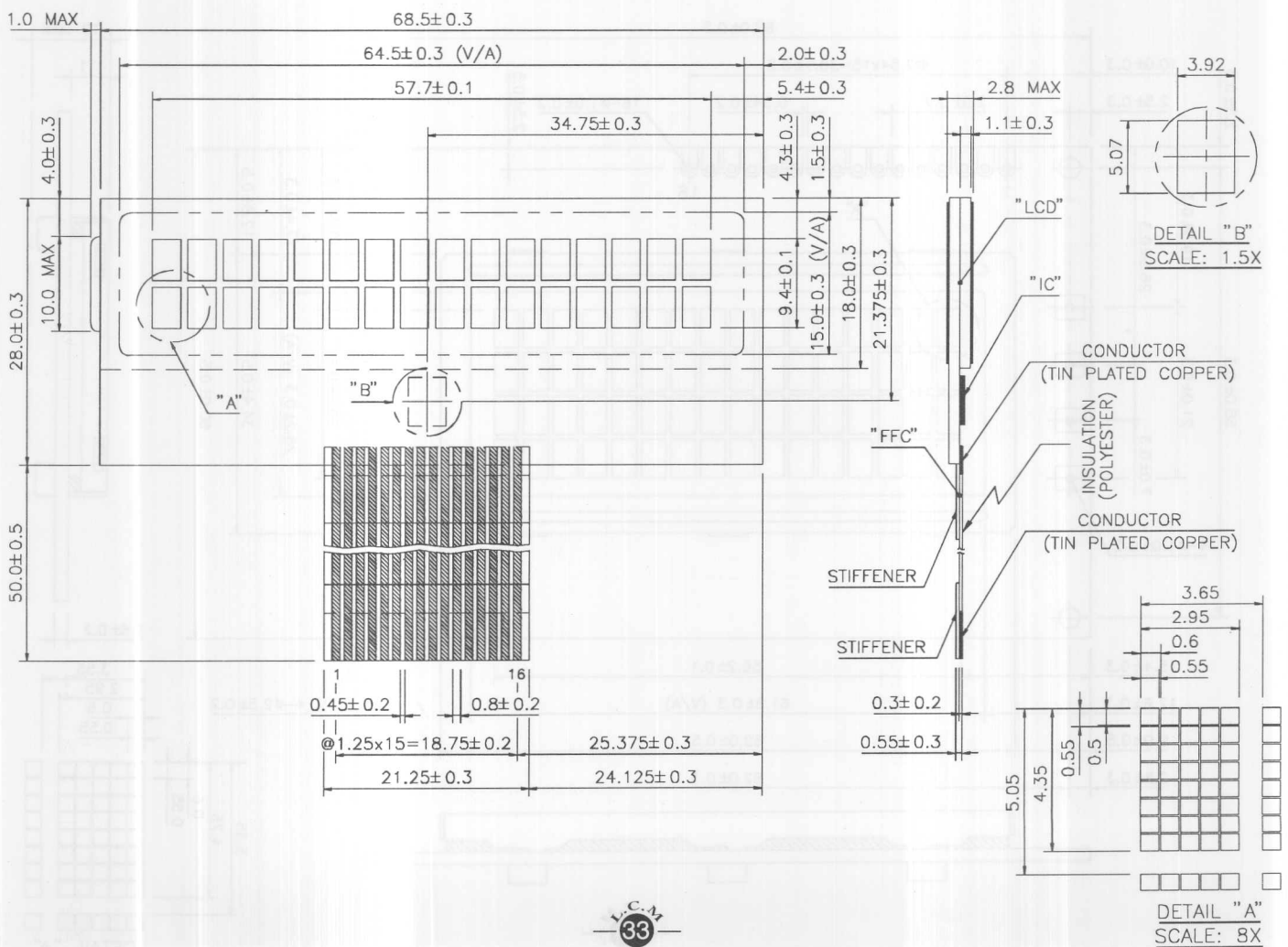
ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	1.0	2.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

OUTLINE DIMENSION:



FEATURE:

- 1. 5x7 dots with cursor
- 2. Built in Controller (HD44780 OR Equivalent)
- 3. +5V Power Supply
(Also available for +3V)
- 4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	Vss		GND(OV)	9	DB2	H/L	DATA BIT2
2	VDD		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V0		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	-----	14	15	16
DD RAM Address	0 0	0 1	0 2	0 3	0 4	-----	0 D	0 E	0 F
DD RAM Address	4 0	4 1	4 2	4 3	4 4	-----	4 D	4 E	4 F
DD RAM Address	1 0	1 1	1 2	1 3	1 4	-----	1 D	1 E	1 F
DD RAM Address	5 0	5 1	5 2	5 3	5 4	-----	5 D	5 E	5 F

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	VDD-V0	Ta = 0°C	----	4.8	----	V
		Ta = 25°C	----	4.5	----	V
		Ta = 50°C	----	4.2	----	V
INPUT VOLTAGE	VI	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	VHI	----	2.2	----	VDD	V
INPUT LOW VOL.	UIL	----	0	----	0.6	V
OUTPUT HIGH VOL.	VOH	----	2.4	----	----	V
OUTPUT LOW VOL.	VOL	----	----	----	0.4	V
SUPPLY CURRENT	IDD	VDD=5V	----	2.5	4.0	mA

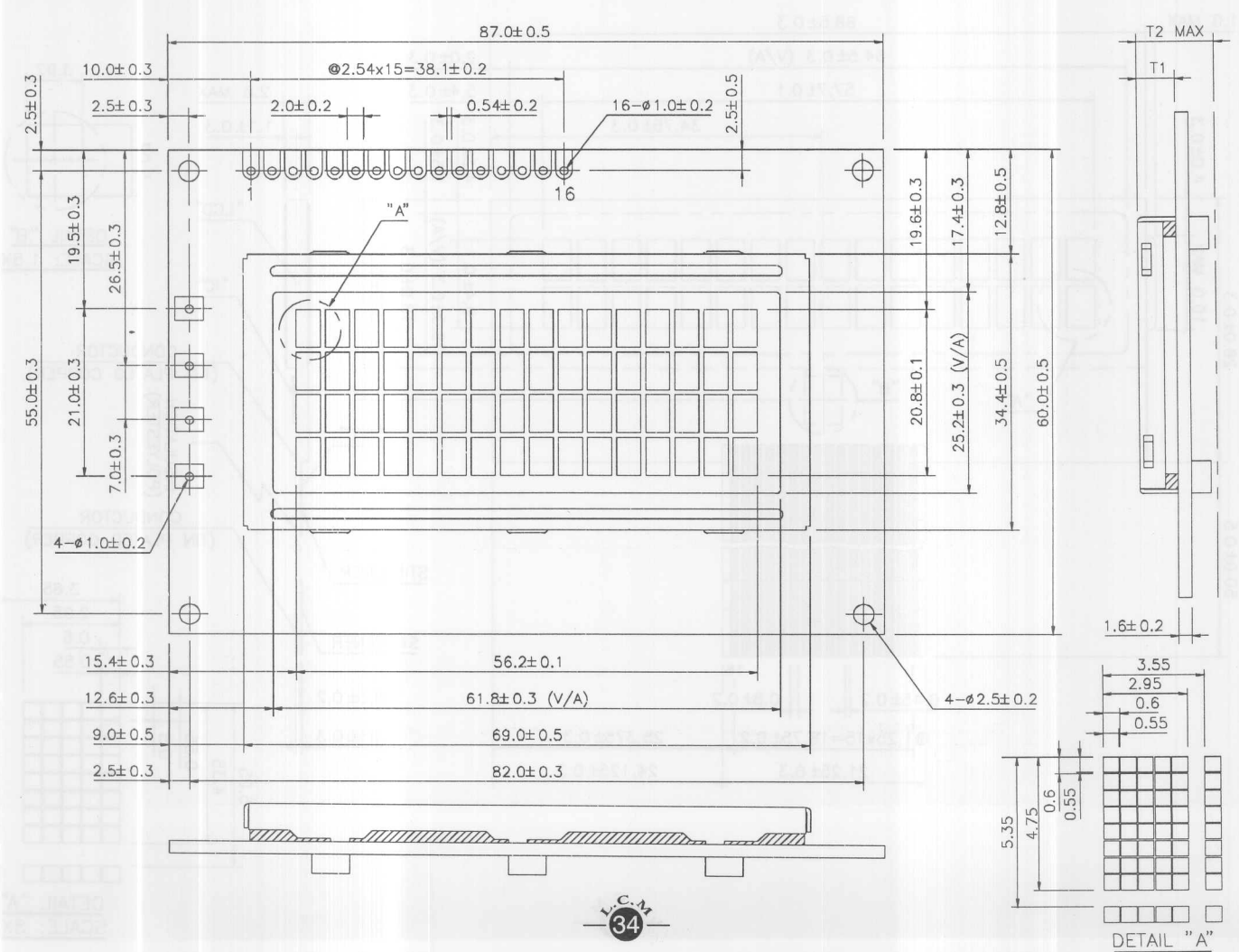
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	TOP	0	---	+50	°C
STORAGE TEMPERATURE	TST	-20	---	+70	°C
INPUT VOLTAGE	VI	VSS	---	VDD	V
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	VDD-V0	0	---	6.5	V

THICKNESS:

Version	T1	T2	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.0	mm

OUTLINE DIMENSION:



FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	_____	GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}	_____	VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V _b	_____	CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

OUTLINE DIMENSION:

ELECTRICAL CHARACTERISTICS:

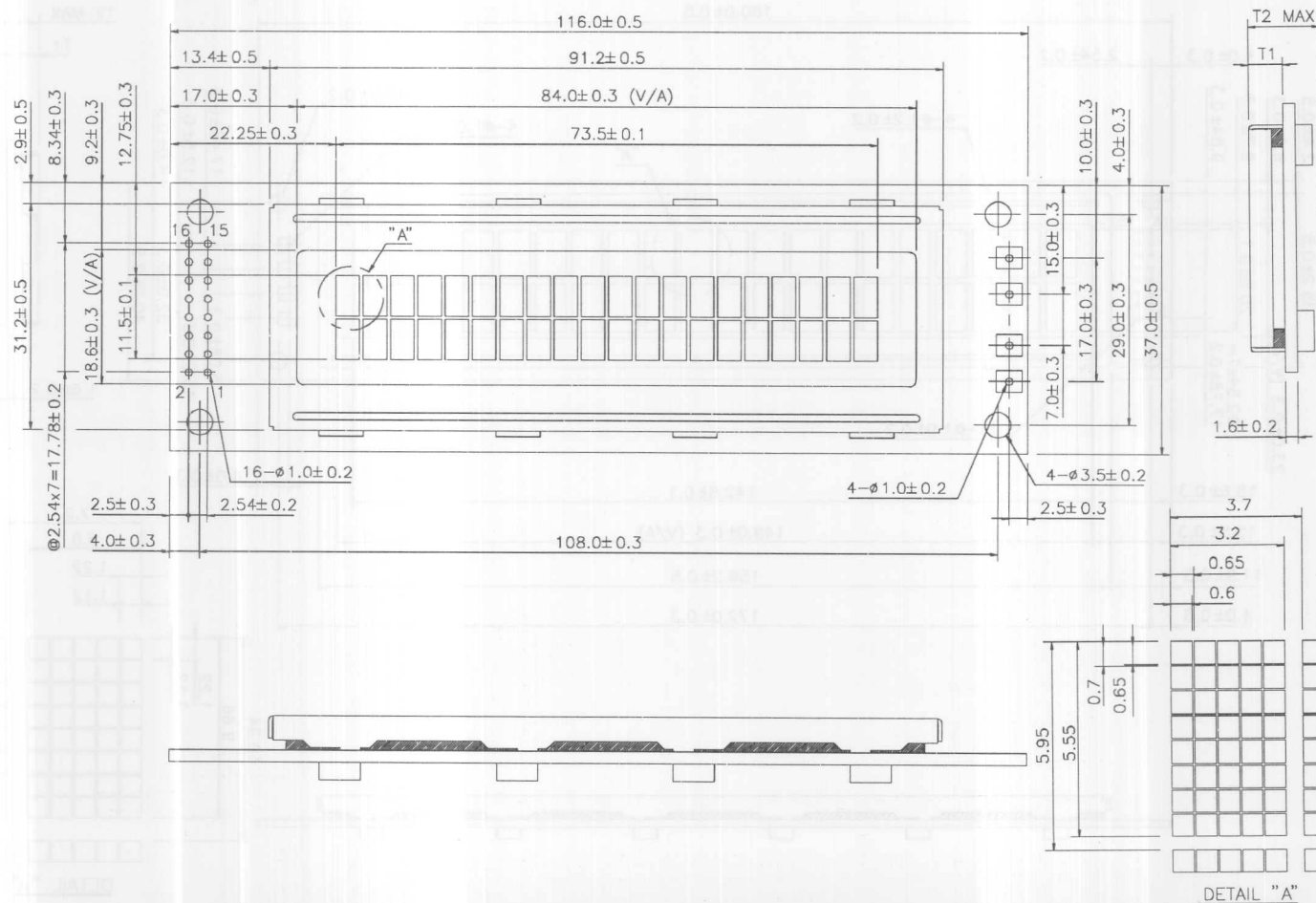
ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _I	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{HI}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OHI}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm



FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

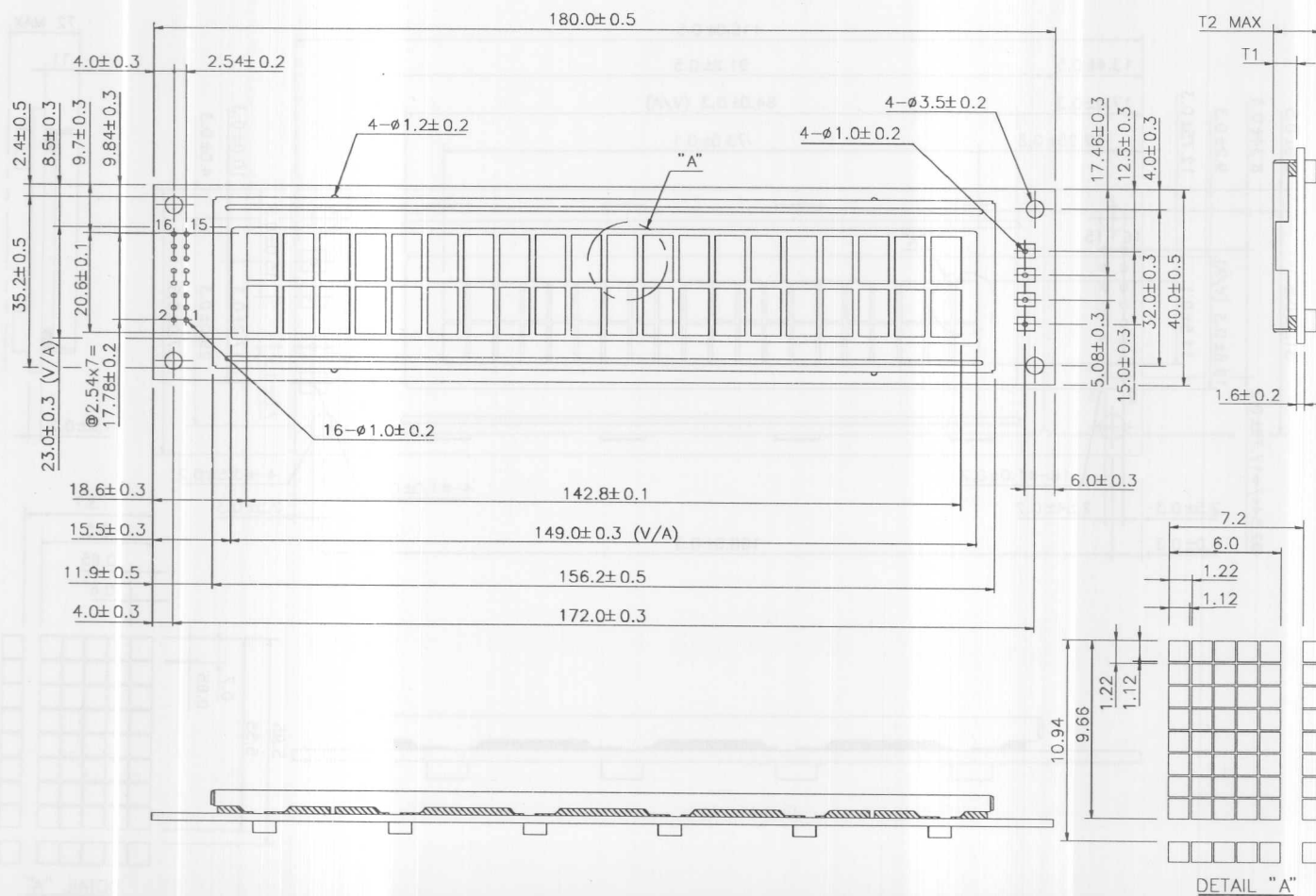
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V _b		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V _b	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _I	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{HI}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{LI}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	3.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V _b	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm

FEATURE:

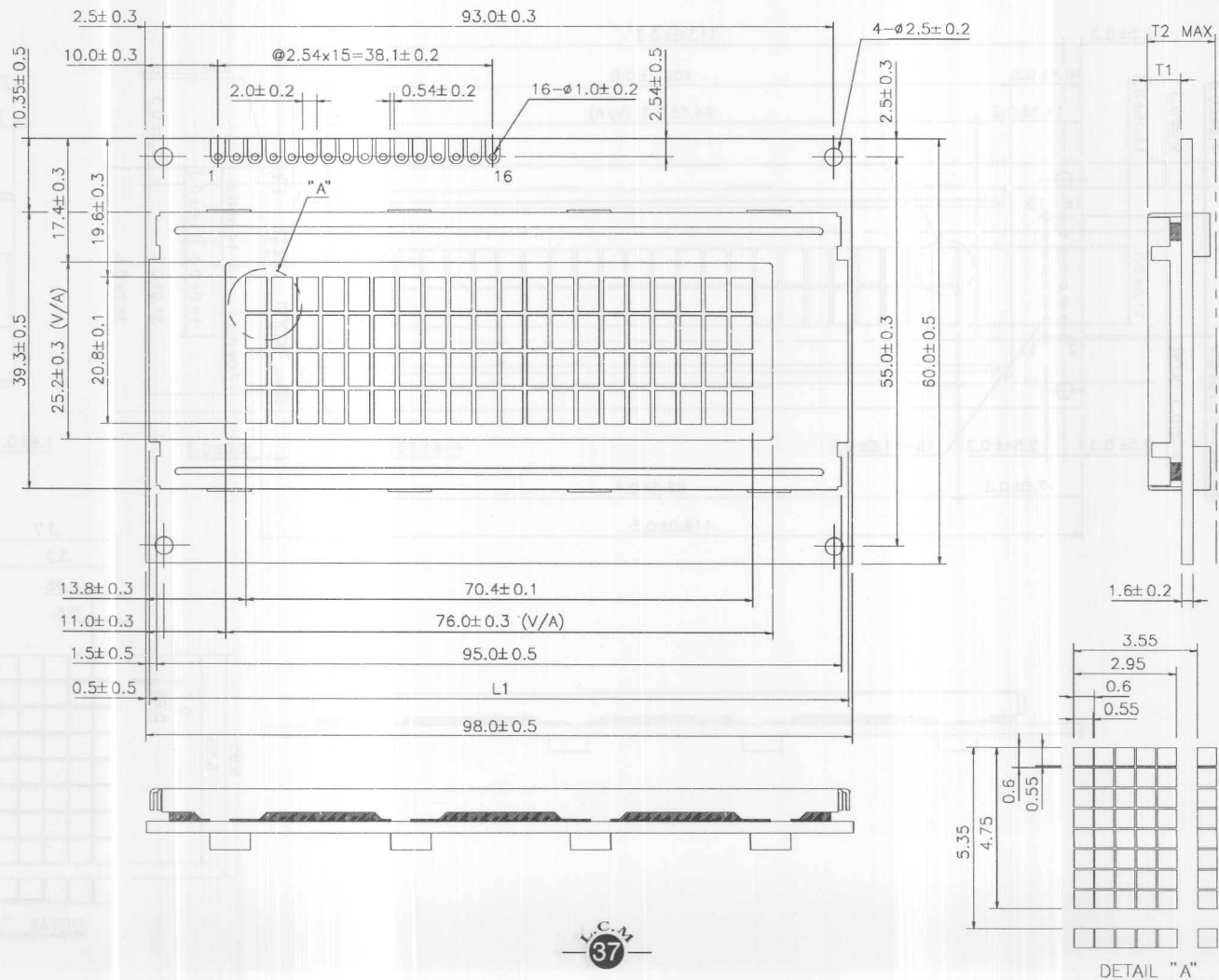
1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(OV)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V _b		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H→L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	.....	14	15	16	17	18	19	20
DD RAM Address	00	01	02	03	04	.....	0D	0E	0F	10	11	12	13
DD RAM Address	40	41	42	43	44	.....	4D	4E	4F	50	51	52	53
DD RAM Address	14	15	16	17	18	.....	21	22	23	24	25	26	27
DD RAM Address	54	55	56	57	58	.....	61	62	63	64	65	66	67

OUTLINE DIMENSION:**ELECTRICAL CHARACTERISTICS:**

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _I	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	3.6	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₁	UNIT
EL & NO Backlight	4.7	9.5	97.0	mm
LED Backlight	9.3	14.5	95.0	mm

WM-C2402M

24x2 Characters

SPECIFICATIONS FOR CHARACTER TYPE LCM

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

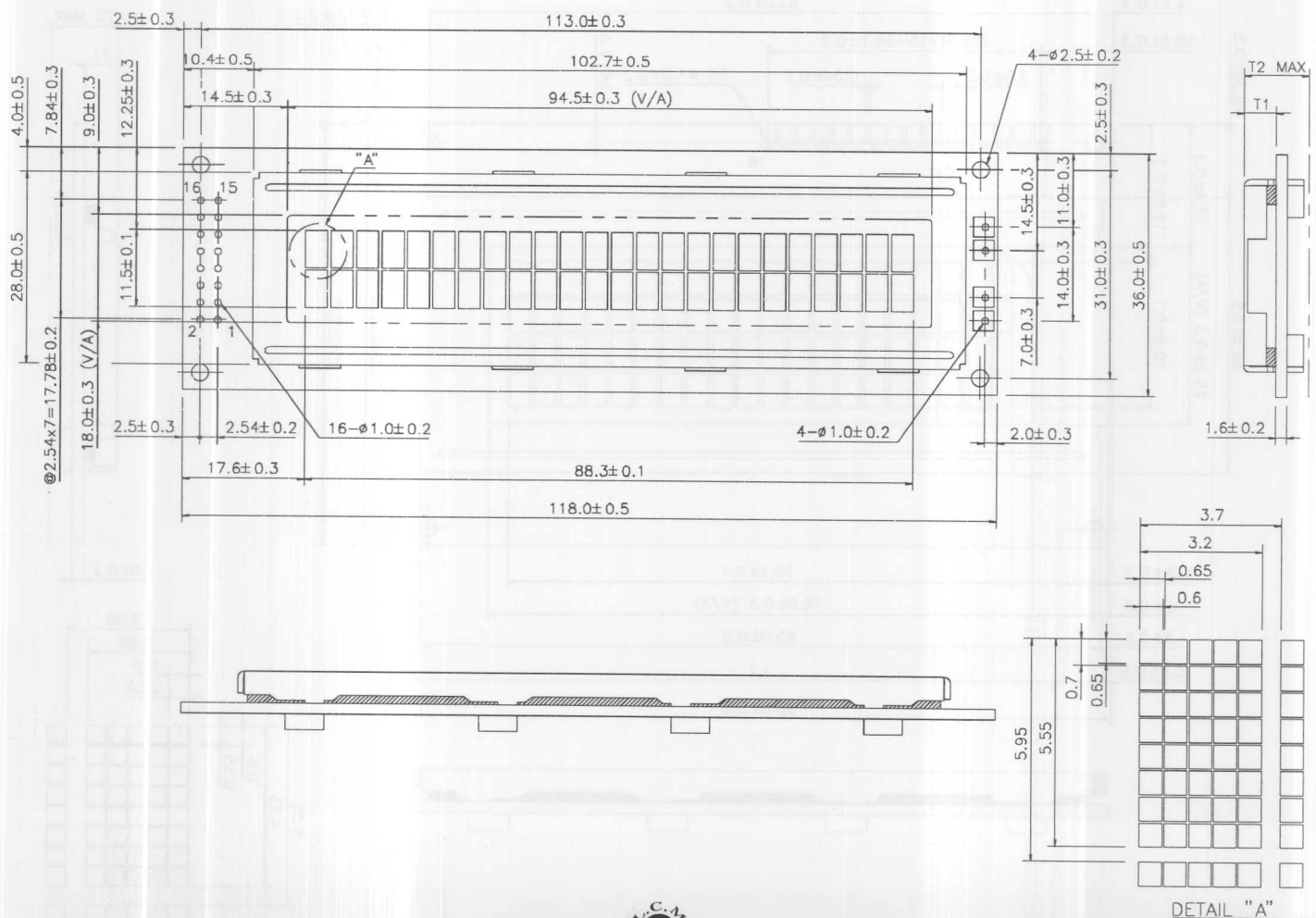
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H,H>L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	.....	15	16	17	18	19	20	21	22	23	24
DD RAM Address	00	01	02	03	04	.....	0E	0F	10	11	12	13	14	15	16	17
DD RAM Address	40	41	42	43	44	.....	4E	4F	50	51	52	53	54	55	56	57

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _I	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	4.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

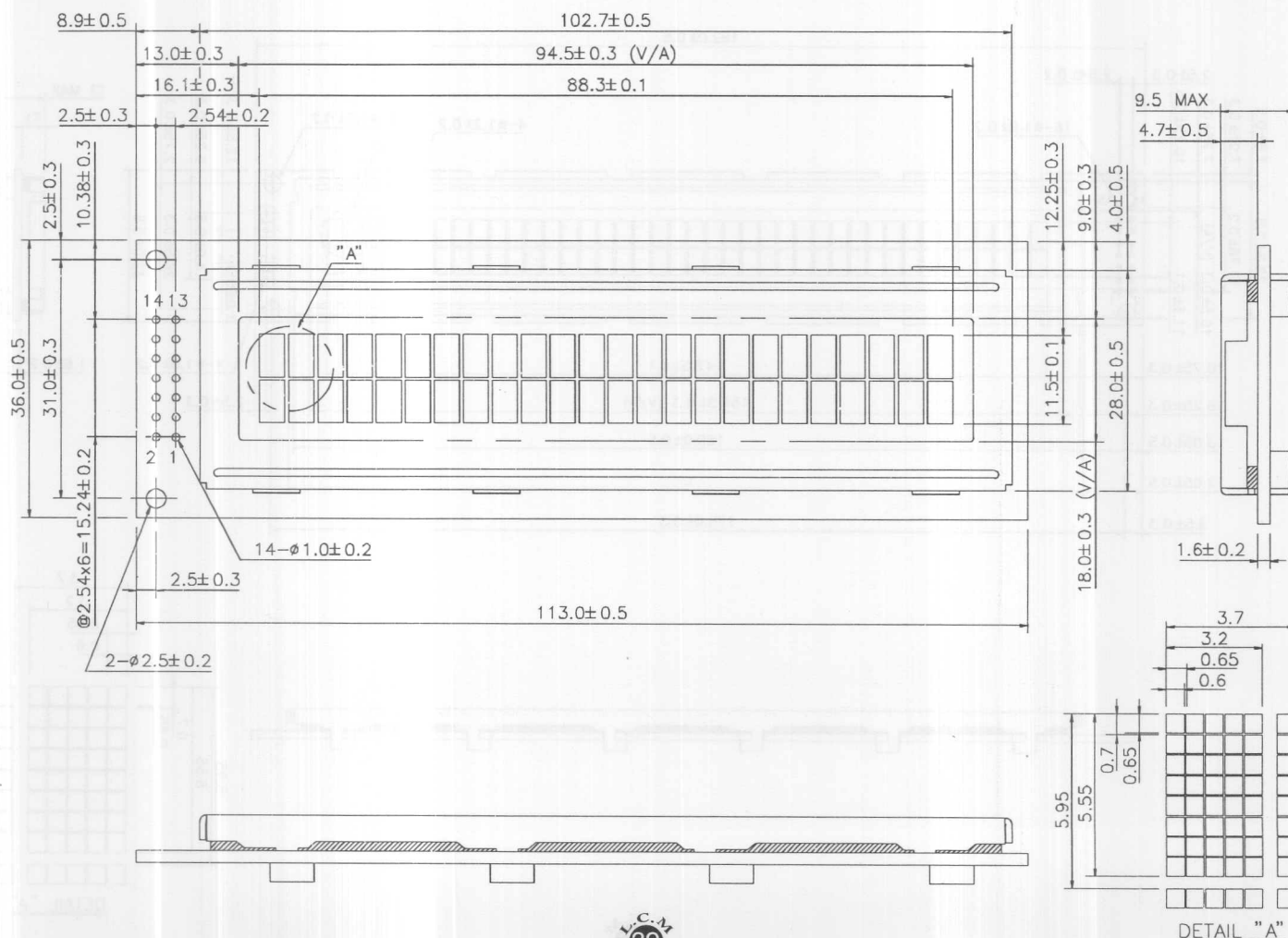
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	—	GND(OV)	8	DB1	H/L	DATA BIT1
2	V _{DD}	—	VCC(+5V±5%)	9	DB2	H/L	DATA BIT2
3	V ₀	—	CONTRAST ADJ.	10	DB3	H/L	DATA BIT3
4	RS	H/L	REGISTER SELECT	11	DB4	H/L	DATA BIT4
5	R/W	H/L	READ/WRITE	12	DB5	H/L	DATA BIT5
6	E	H,H→L	ENABLE SIGNAL	13	DB6	H/L	DATA BIT6
7	DB0	H/L	DATA BIT0	14	DB7	H/L	DATA BIT7

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	.....	15	16	17	18	19	20	21	22	23	24
DD RAM Address	00	01	02	03	04	.....	0E	0F	10	11	12	13	14	15	16	17
DD RAM Address	40	41	42	43	44	.....	4E	4F	50	51	52	53	54	55	56	57

OUTLINE DIMENSION:



ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	----	4.8	----	V
		T _a = 25°C	----	4.5	----	V
		T _a = 50°C	----	4.2	----	V
INPUT VOLTAGE	V _I	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	----	2.2	----	V _{DD}	V
INPUT LOW VOL.	V _{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL.	V _{OH}	----	2.4	----	----	V
OUTPUT LOW VOL.	V _{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	----	2.0	4.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

WM-C4002M

40x2 Characters

SPECIFICATIONS FOR CHARACTER TYPE LCM

FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}		GND(0V)	9	DB2	H/L	DATA BIT2
2	V _{DD}		VCC(+5V±5%)	10	DB3	H/L	DATA BIT3
3	V ₀		CONTRAST ADJ.	11	DB4	H/L	DATA BIT4
4	RS	H/L	REGISTER SELECT	12	DB5	H/L	DATA BIT5
5	R/W	H/L	READ/WRITE	13	DB6	H/L	DATA BIT6
6	E	H _H →L	ENABLE SIGNAL	14	DB7	H/L	DATA BIT7
7	DB0	H/L	DATA BIT0	15	LED(+)	4.2V	BACKLIGHT(+)
8	DB1	H/L	DATA BIT1	16	LED(-)	0V	BACKLIGHT(-)

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	.....	34	35	36	37	38	39	40
DD RAM Address	0 0	0 1	0 2	0 3	0 4	.....	2 1	2 2	2 3	2 4	2 5	2 6	2 7
DD RAM Address	4 0	4 1	4 2	4 3	4 4	.....	6 1	6 2	6 3	6 4	6 5	6 6	6 7

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	T _a = 0°C	---	4.8	---	V
		T _a = 25°C	---	4.5	---	V
		T _a = 50°C	---	4.2	---	V
INPUT VOLTAGE	V _I	---	4.7	5.0	5.3	V
INPUT HIGH VOL.	V _{IH}	---	2.2	---	V _{DD}	V
INPUT LOW VOL.	V _{IL}	---	0	---	0.6	V
OUTPUT HIGH VOL.	V _{OH}	---	2.4	---	---	V
OUTPUT LOW VOL.	V _{OL}	---	---	---	0.4	V
SUPPLY CURRENT	I _{DD}	V _{DD} =5V	---	2.5	4.0	mA

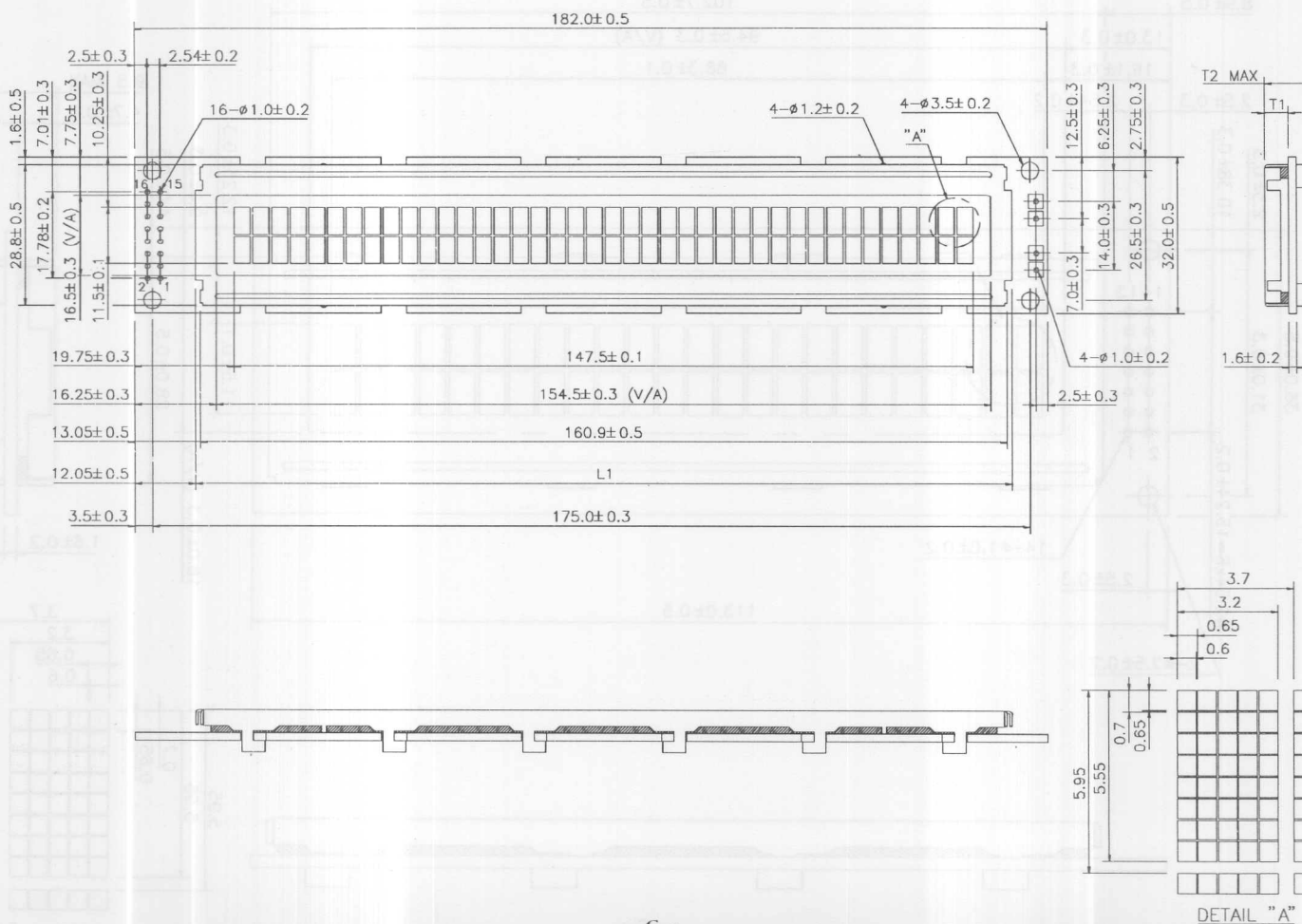
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS & BEZEL WIDTH:

Version	T ₁	T ₂	L ₂	UNIT
EL & NO Backlight	4.7	9.5	162.9	mm
LED Backlight	9.3	14.5	160.9	mm

OUTLINE DIMENSION:



FEATURE:

1. 5x7 dots with cursor
2. Built in Controller (HD44780 OR Equivalent)
3. +5V Power Supply
(Also available for +3V)
4. 1/16 Duty Cycle

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	DB7	H/L	DATA BIT7	9	E1	H,H \rightarrow L	ENABLE SIGNAL 1
2	DB6	H/L	DATA BIT6	10	R/W	H/L	READ/WRITE
3	DB5	H/L	DATA BIT5	11	RS	H/L	REGISTER SELECT
4	DB4	H/L	DATA BIT4	12	V ₀	----	CONTRAST ADJ.
5	DB3	H/L	DATA BIT3	13	V _{SS}	----	GND(OV)
6	DB2	H/L	DATA BIT2	14	V _{DD}	----	V _{CC} (+5V \pm 5%)
7	DB1	H/L	DATA BIT1	15	E2	H,H \rightarrow L	ENABLE SIGNAL 2
8	DB0	H/L	DATA BIT0	16	NC	----	NO CONNECTION

DISPLAY CHARACTER ADDRESS CODE:

Diagram illustrating the memory layout for the **DD RAM Address** and **Display Position** registers, showing the mapping of data to memory locations.

The diagram is divided into two sections: **USE E1 TO ENABLE** and **USE E2 TO ENABLE**.

USE E1 TO ENABLE:

- LINES 1:** Display Position (00 to 04, ..., 1E to 1F)
- LINES 2:** DD RAM Address (40 to 44, ..., 5E to 5F)

USE E2 TO ENABLE:

- LINES 3:** Display Position (00 to 04, ..., 1E to 1F)
- LINES 4:** DD RAM Address (40 to 44, ..., 5E to 5F)

The diagram shows that the memory layout is identical for both **USE E1 TO ENABLE** and **USE E2 TO ENABLE** configurations.

OUTLINE DIMENSION:

ELECTRICAL CHARACTERISTICS:

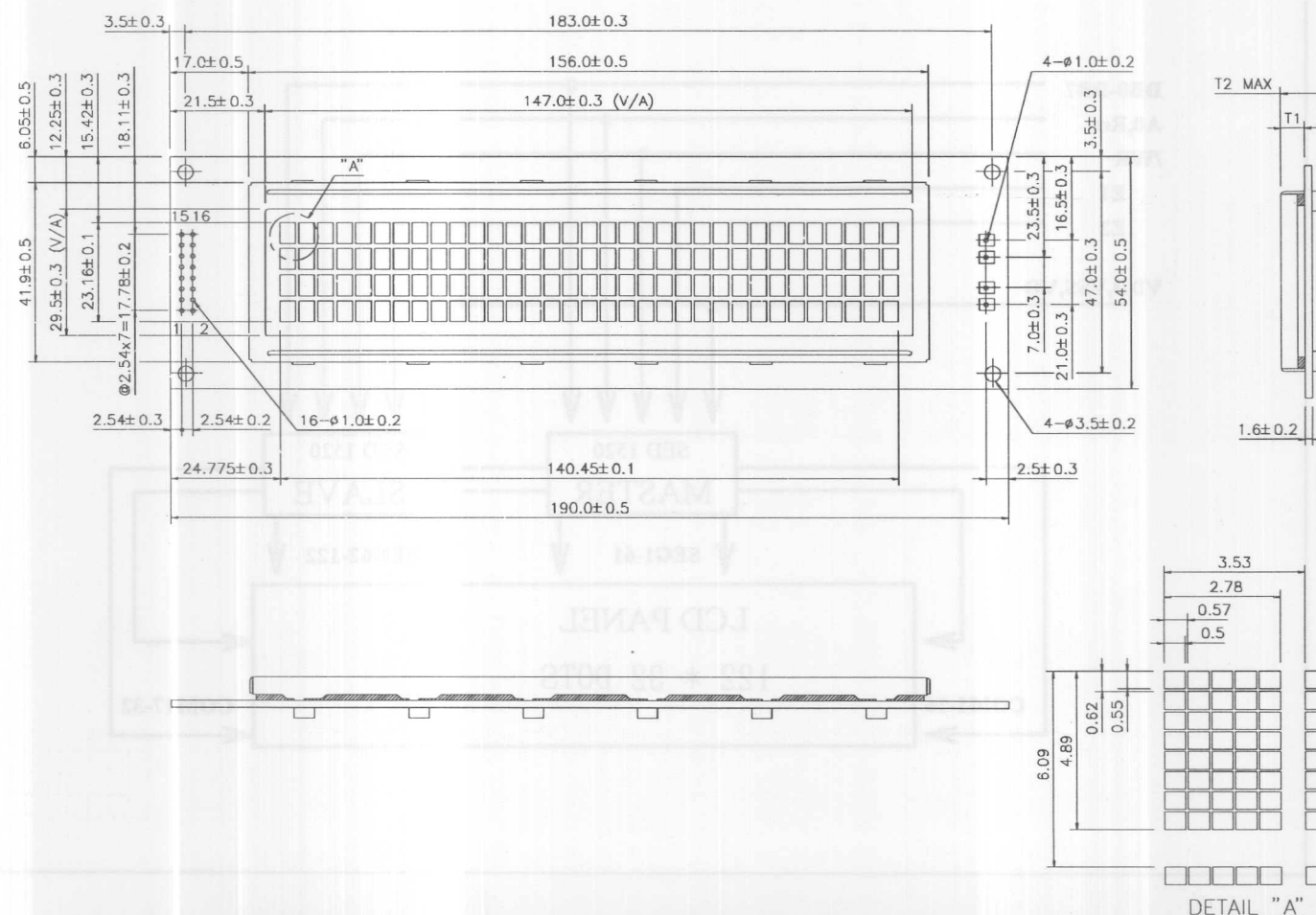
ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	$T_a = 0^{\circ}\text{C}$	----	4.8	----	V
		$T_a = 25^{\circ}\text{C}$	----	4.5	----	V
		$T_a = 50^{\circ}\text{C}$	----	4.2	----	V
INPUT VOLTAGE	V_i	----	4.7	5.0	5.3	V
INPUT HIGH VOL.	V_{HI}	----	2.2	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	0.6	V
OUTPUT HIGH VOL	V_{OH}	----	2.4	----	----	V
OUTPUT LOW VOL	V_{OL}	----	----	----	0.4	V
SUPPLY CURRENT	I_{DD}	$V_{DD}=5V$	----	4.0	10.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	6.5	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	6.5	V

THICKNESS:

Version	T ₁	T ₂	UNIT
EL & NO Backlight	4.7	9.5	mm
LED Backlight	9.3	14.5	mm



FEATURE:

1. Built in Controller (SED1520 or Equivalent)
2. $V_{OP}=4.6V$
3. Both available for Internal oscillation and External Oscillation type.

ELECTRICAL CHARACTERISTICS:

ITEM		CONDITION	MIN.	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	$V_{DD}=5V\pm5\%$	4.5	5.0	5.5	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_0$ (V_{OP})	$T=25^\circ C$	----	3.5	----	V
INPUT HIGH VOL.	V_{IH}	$V_{DD}=5V\pm5\%$	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	$V_{DD}=5V\pm5\%$	0	----	0.3V	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5.0V$	----	1.0	1.5	mA
POWER SUPPLY FOR EL	V_{BL}	$f_{BL}=400Hz$	----	100	----	V_{RMS}
	I_{BL}		----	----	5.0	mA

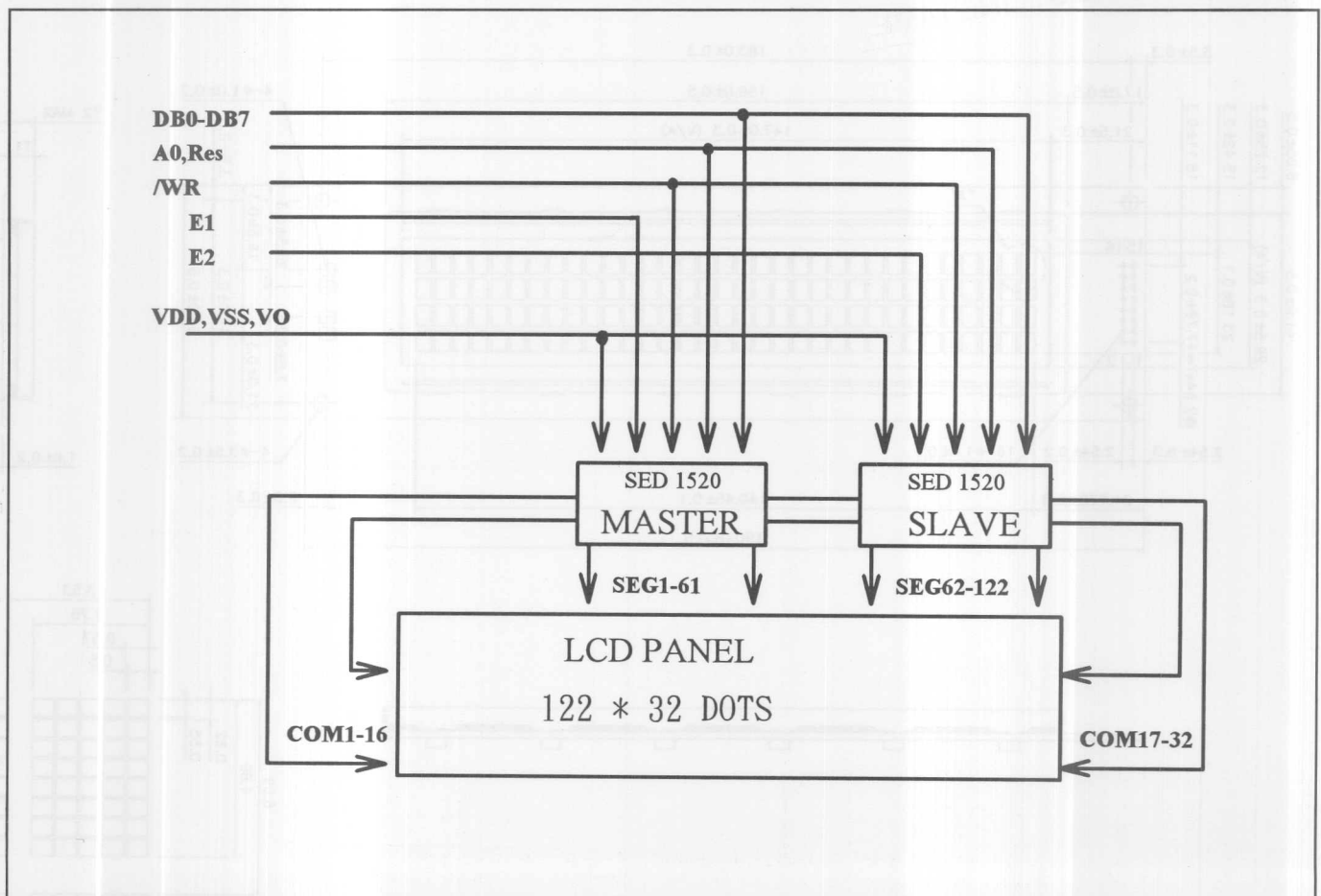
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	---	+50	$^\circ C$
STORAGE TEMPERATURE	T_{ST}	-20	---	+60	$^\circ C$
INPUT VOLTAGE	V_I	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	8.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	0	---	16.5	V

THICKNESS:

Version	T_1	T_2	UNIT
EL & NO Backlight	5.4	10	mm
LED Backlight	8.9	13	mm

BLOCK DIAGRAM:



INTERFACE PIN CONNECTIONS:

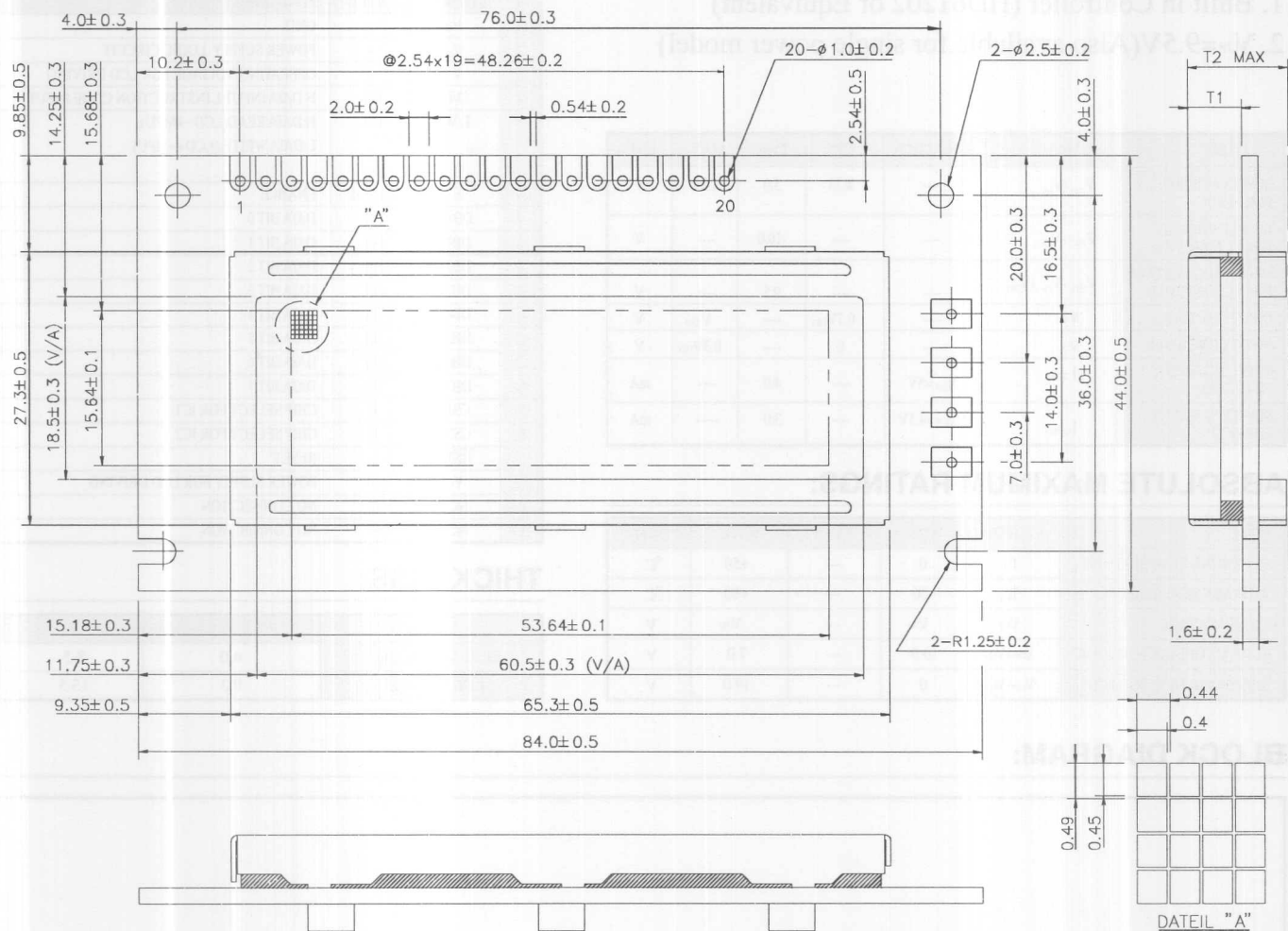
INTERNAL OSCILLATION TYPE:

NO	SYMBOL	LEVEL	FUNCTION
1	V_{SS}	-	GND
2	V_{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT
3	VO	-	CONTRAST ADJ.
4	A0	H/L	H-DATA, L-INSTRUCTION
5	E1	-	ENABLE CHIP1
6	E2	-	ENABLE CHIP2
7	NC	-	NO CONNECTION
8	NC	-	NO CONNECTION
9	/WR(R/W)	-	/WR FOR 80 SERIAL, R/W FOR 68 SERIAL
10	DB 0	H/L	DATA BIT 0
11	DB1	H/L	DATA BIT 1
12	DB2	H/L	DATA BIT 2
13	DB3	H/L	DATA BIT 3
14	DB4	H/L	DATA BIT 4
15	DB5	H/L	DATA BIT 5
16	DB6	H/L	DATA BIT 6
17	DB7	H/L	DATA BIT 7
18	RES	H/L	H-68 SERIAL L-80 SERIAL
19	LED(+)	4.2V	BACKLIGHT(+)
20	LED(-)	0V	BACKLIGHT(-)

EXTERNAL OSCILLATION TYPE:

NO	SYMBOL	LEVEL	FUNCTION
1	V_{SS}	-	GND
2	V_{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT
3	VO	-	CONTRAST ADJ.
4	A0	H/L	H-DATA, L-INSTRUCTION
5	CS1	L	CHIP 1 ENABLE ACTIVE "L"
6	CS2	L	CHIP 2 ENABLE ACTIVE "L"
7	CL	H/L	EXTERNAL CLOCK (2KHz)
8	RD	-	/RD FOR 80 SERIAL, E FOR 68 SERIAL
9	WR(R/W)	-	/WR FOR 80 SERIAL, R/W FOR 68 SERIAL
10	DB 0	H/L	DATA BIT 0
11	DB1	H/L	DATA BIT 1
12	DB2	H/L	DATA BIT 2
13	DB3	H/L	DATA BIT 3
14	DB4	H/L	DATA BIT 4
15	DB5	H/L	DATA BIT 5
16	DB6	H/L	DATA BIT 6
17	DB7	H/L	DATA BIT 7
18	RES	H/L	H-68 SERIAL L-80 SERIAL
19	LED(+)	4.2V	BACKLIGHT(+)
20	LED(-)	0V	BACKLIGHT(-)

OUTLINE DIMENSION:

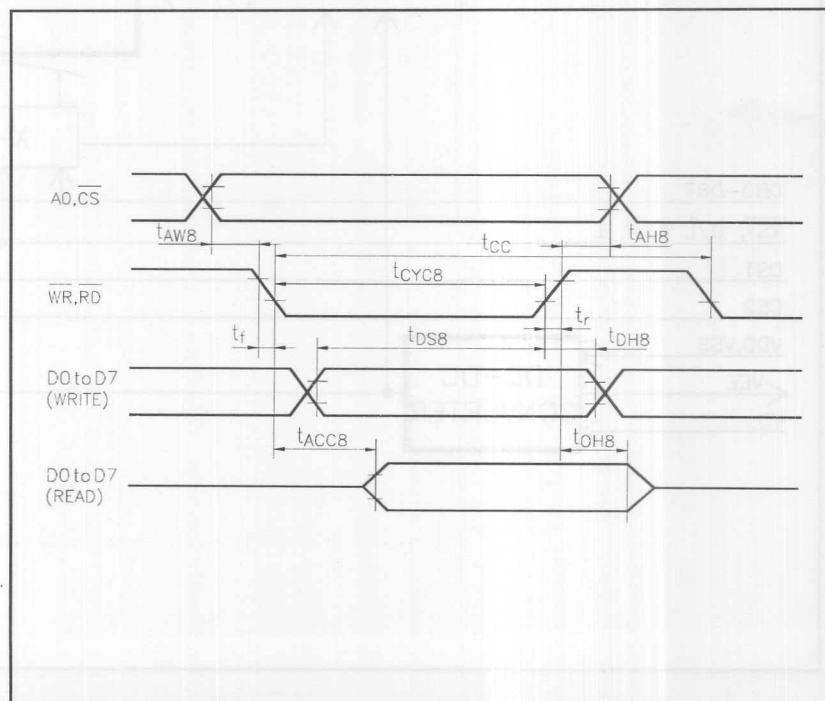


TIMING SPECIFICATIONS:

Ta=-20 to 75 deg. C, Vss=-5.0V±10% unless stated otherwise

Parameter	Symbol	Condition	Rating		UNIT	Single
			Min.	Max.		
Address hold time	t _{AH8}		10	---	ns	A0,CS
Address setup time	t _{AW8}		20	---	ns	
System cycle time	t _{CYC8}		1000	---	ns	WR,RD
Control pulsewidth	t _{CC}		200	---	ns	
Data setup time	t _{DS8}		80	---	ns	D0 to D7
Data hold time	t _{DH8}		10	---	ns	
RD access time	t _{ACC8}	CL=100pF	---	90	ns	
Output disable time	t _{CH8}		10	60	ns	
Rise and fall time	t _{r,tf}		---	15	ns	---

TIMING CHART:



FEATURE:

1. Built in Controller (HD61202 or Equivalent)
2. $V_{OP}=9.5V$ (Also available for single power model)

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	----	4.75	5.0	5.25	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{IH}-V_{SS}$	----	----	-10.0	----	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_O$ (V_{OP})	----	----	9.5	----	V
INPUT HIGH VOL.	V_{IH}	----	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW LEVEL	V_{IL}	----	0	----	$0.3V_{DD}$	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5V$	----	4.0	----	mA
SUPPLY CURRENT FOR LCD	I_{LCD}	$V_O = -4.5V$	----	3.0	----	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_I	0	---	+50	°C
STORAGE TEMPERATURE	T_{OP}	-20	---	+60	°C
INPUT VOLTAGE	V_{ST}	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_O$	0	---	19.0	V

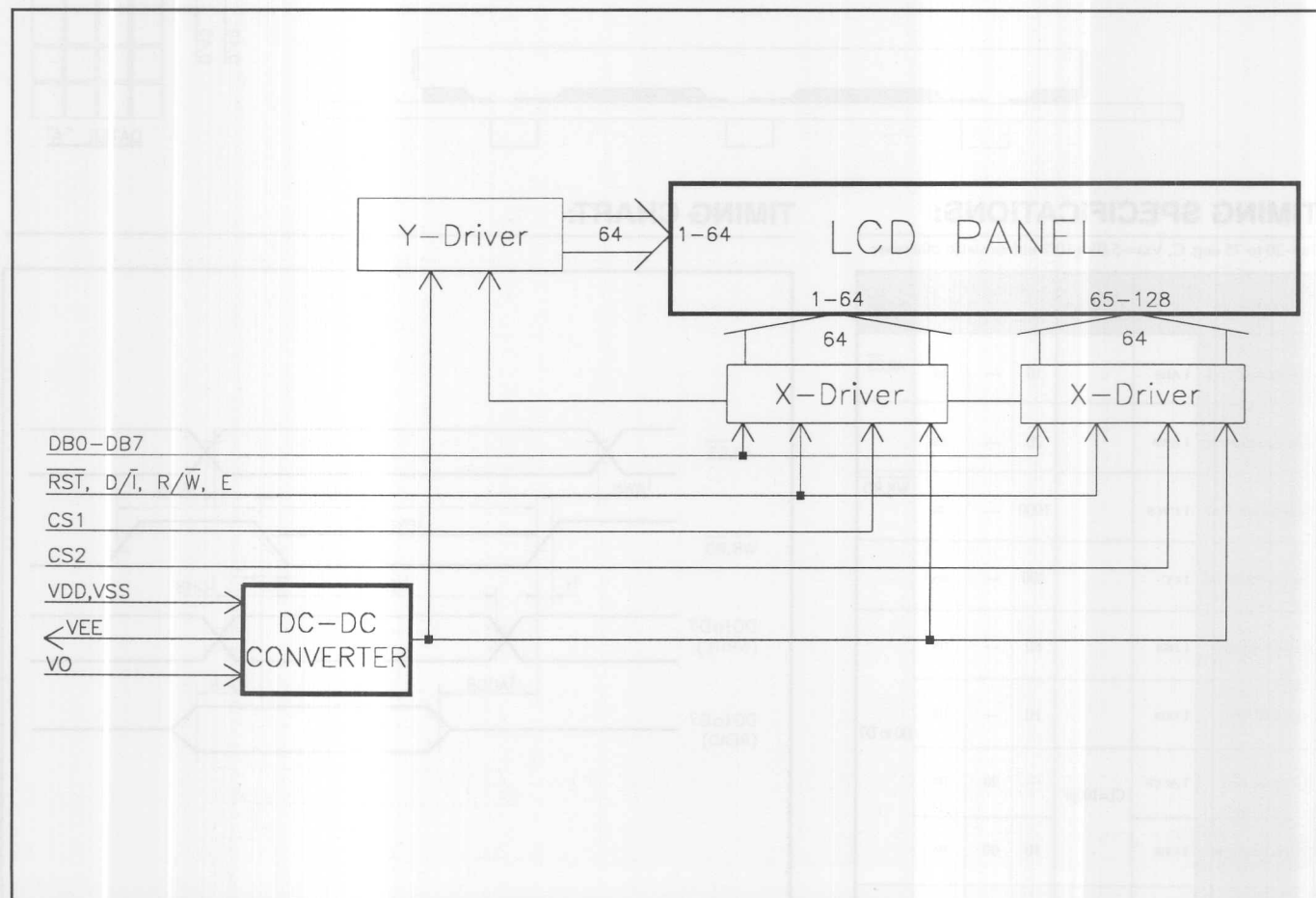
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	V_{SS}	-	GND
2	V_{DD}	-	POWER SUPPLY LOGIC CIRCUIT
3	V_O	-	OPERATING VOLTAGE FOR LCD DRIVING
4	D/I	H/L	H: DATA INPUT; L: INSTRUCTION CODE INPUT
5	R/W	H/L	H: DATA READ (LCD → MPU); L: DATA WRITE (LCD ← MPU)
6	E	H, H → L	ENABLE
7	DB0	H/L	DATA BIT 0
8	DB1	H/L	DATA BIT 1
9	DB2	H/L	DATA BIT 2
10	DB3	H/L	DATA BIT 3
11	DB4	H/L	DATA BIT 4
12	DB5	H/L	DATA BIT 5
13	DB6	H/L	DATA BIT 6
14	DB7	H/L	DATA BIT 7
15	CS1	H	CHIP SELECT FOR IC1
16	CS2	H	CHIP SELECT FOR IC2
17	RST	L	RESET
18	V_{IH}	---	POWER SUPPLY FOR LCD DRIVING
19	NC	---	NO CONNECTION
20	NC	---	NO CONNECTION

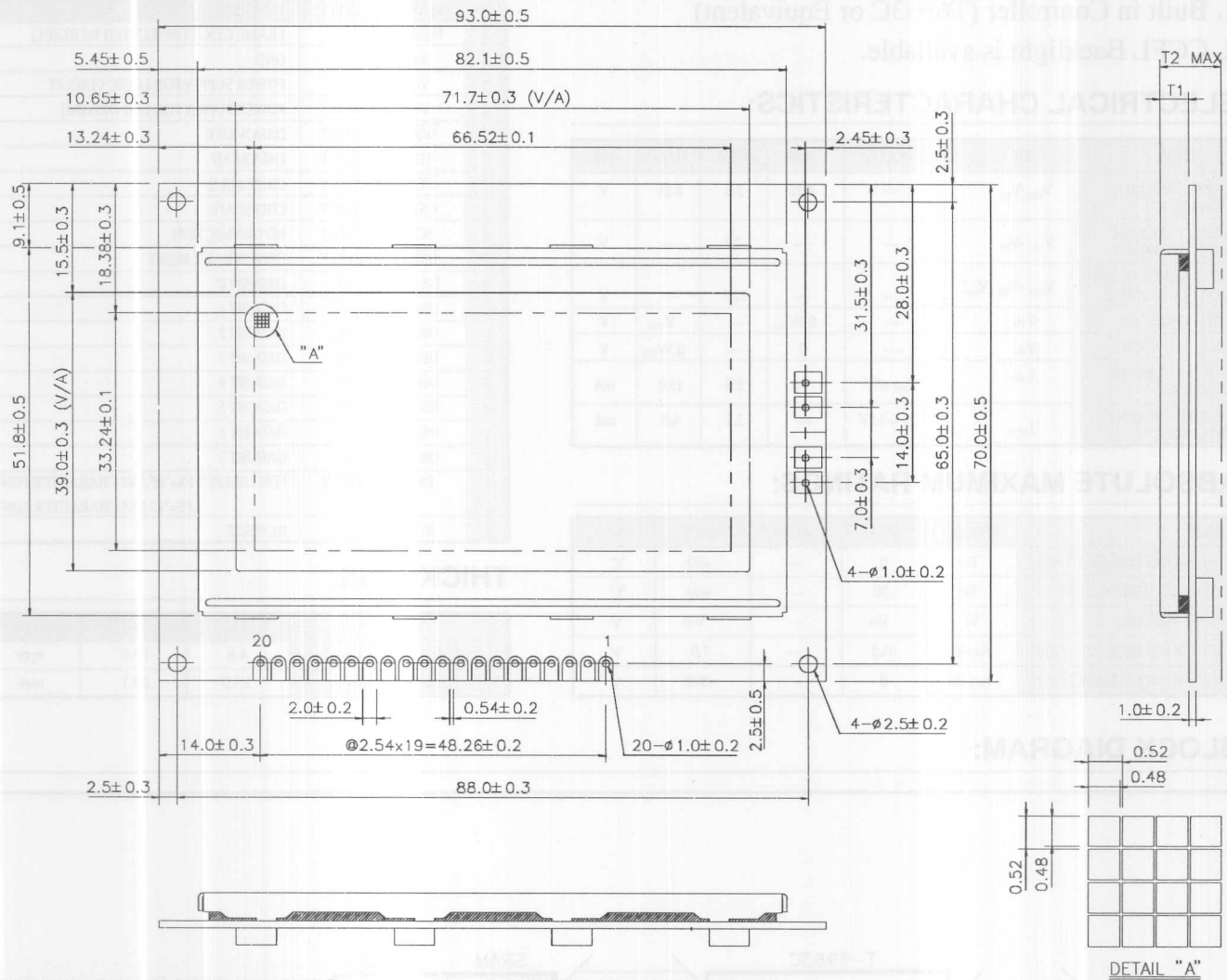
THICKNESS:

Version	T_1	T_2
EL & NO Backlight	4.0	8.5
LED Backlight	9.3	13.5

BLOCK DIAGRAM:



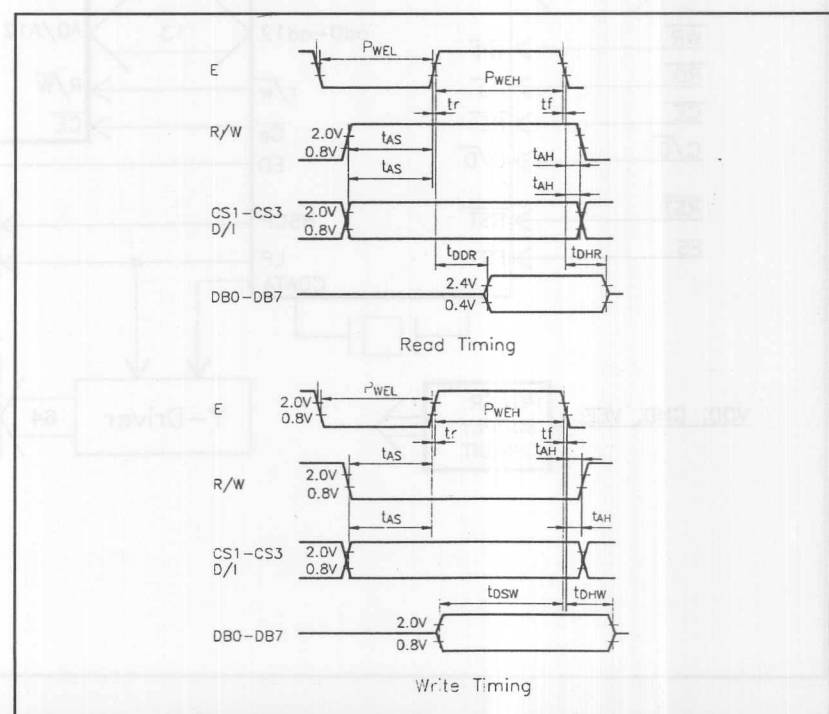
OUTLINE DIMENSION:



TIMING SPECIFICATIONS:

Item	Symbol	MIN	Typ	Max	Unit
E cycle time	t_{CYC}	1000	—	—	ns
E high level width	P_{WEH}	450	—	—	ns
E low level width	P_{WEL}	450	—	—	ns
E rise time	t_r	—	—	25	ns
E fall time	t_f	—	—	25	ns
Address setup time	t_{AS}	140	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data setup time	t_{DSW}	200	—	—	ns
Data delay time	t_{DDR}	—	—	320	ns
Data hold time (White)	t_{DHW}	10	—	—	ns
Data hold time (Read)	t_{DHR}	20	—	—	ns

TIMING CHART:



FEATURE:

1. Built in Controller (T6963C or Equivalent)
2. CCFL Backlight is available.

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	----	4.75	5.0	5.25	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{IE}-V_{SS}$	----	----	-7.5	----	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_{SS} (V_{OP})$	----	----	12.5	----	V
INPUT HIGH VOL.	V_{IH}	----	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	$0.3V_{DD}$	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5V$	----	9.0	15.0	mA
SUPPLY CURRENT FOR LCD	I_{LCD}	$V_{IE}=-7.5V$	----	2.5	4.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T_{ST}	-20	---	+60	°C
INPUT VOLTAGE	V_I	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	0	---	19.0	V

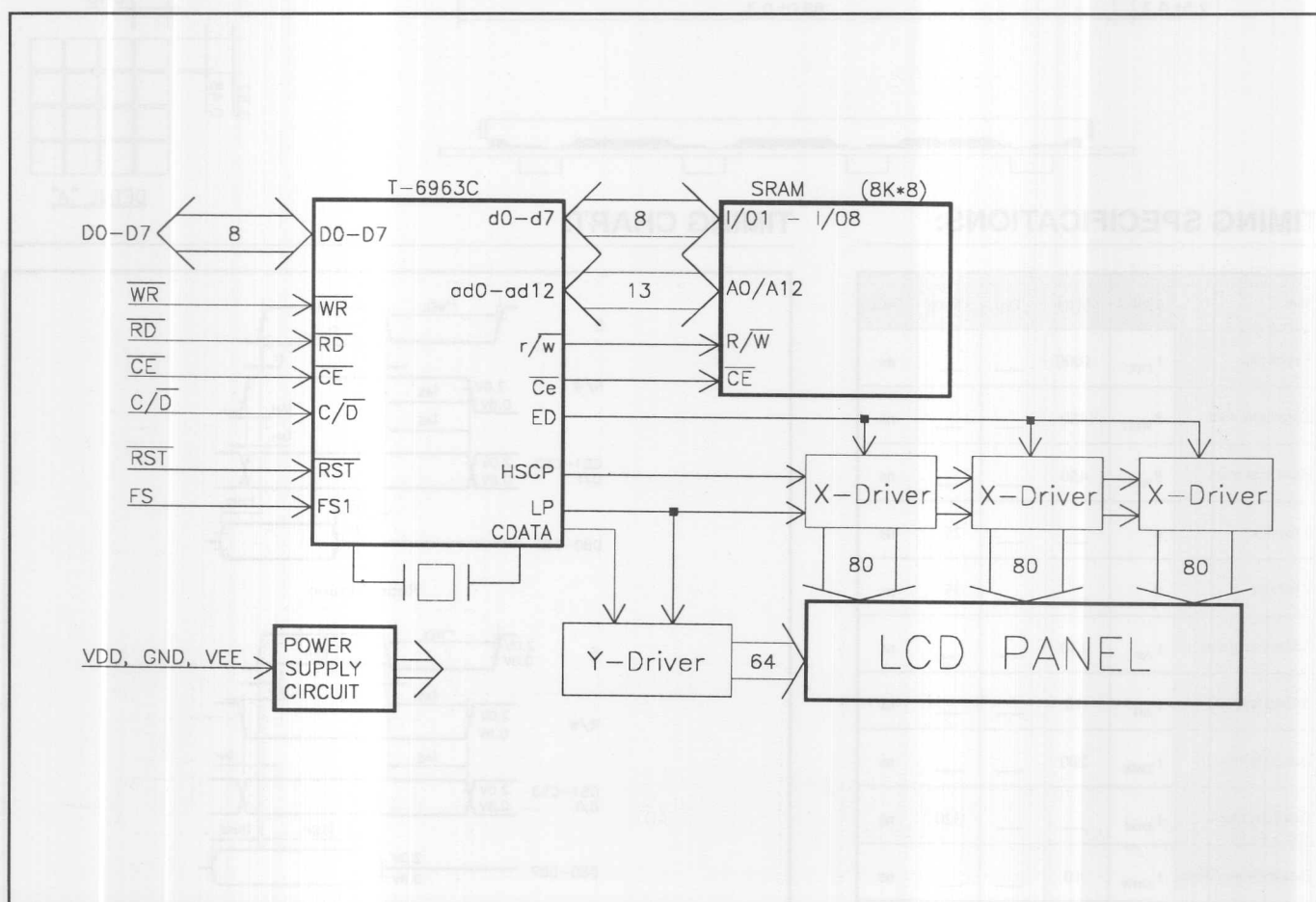
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	FGND	-	FRAME GEN (CONNECTED TO BEZEL)
2	V_{SS}	-	GND
3	V_{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT
4	V_{IE}	-	POWER SUPPLY FOR LCD DRIVING
5	WR	INPUT	DATA WRITE
6	RD	INPUT	DATA READ
7	CE	INPUT	CHPEABLE
8	C/D	INPUT	CODE/DATE
9	NC	INPUT	NO CONNECTION
10	RST	INPUT	CONTROLLER RESET
11	DB0	I/O	DATA BIT 0
12	DB1	I/O	DATA BIT 1
13	DB2	I/O	DATA BIT 2
14	DB3	I/O	DATA BIT 3
15	DB4	I/O	DATA BIT 4
16	DB5	I/O	DATA BIT 5
17	DB6	I/O	DATA BIT 6
18	DB7	I/O	DATA BIT 7
19	FS	INPUT	FONT SELECT FS="H", 6X8 CHARACTER FONT FS="L", 8X8 CHARACTER FONT
20	RV	-	REVERSE

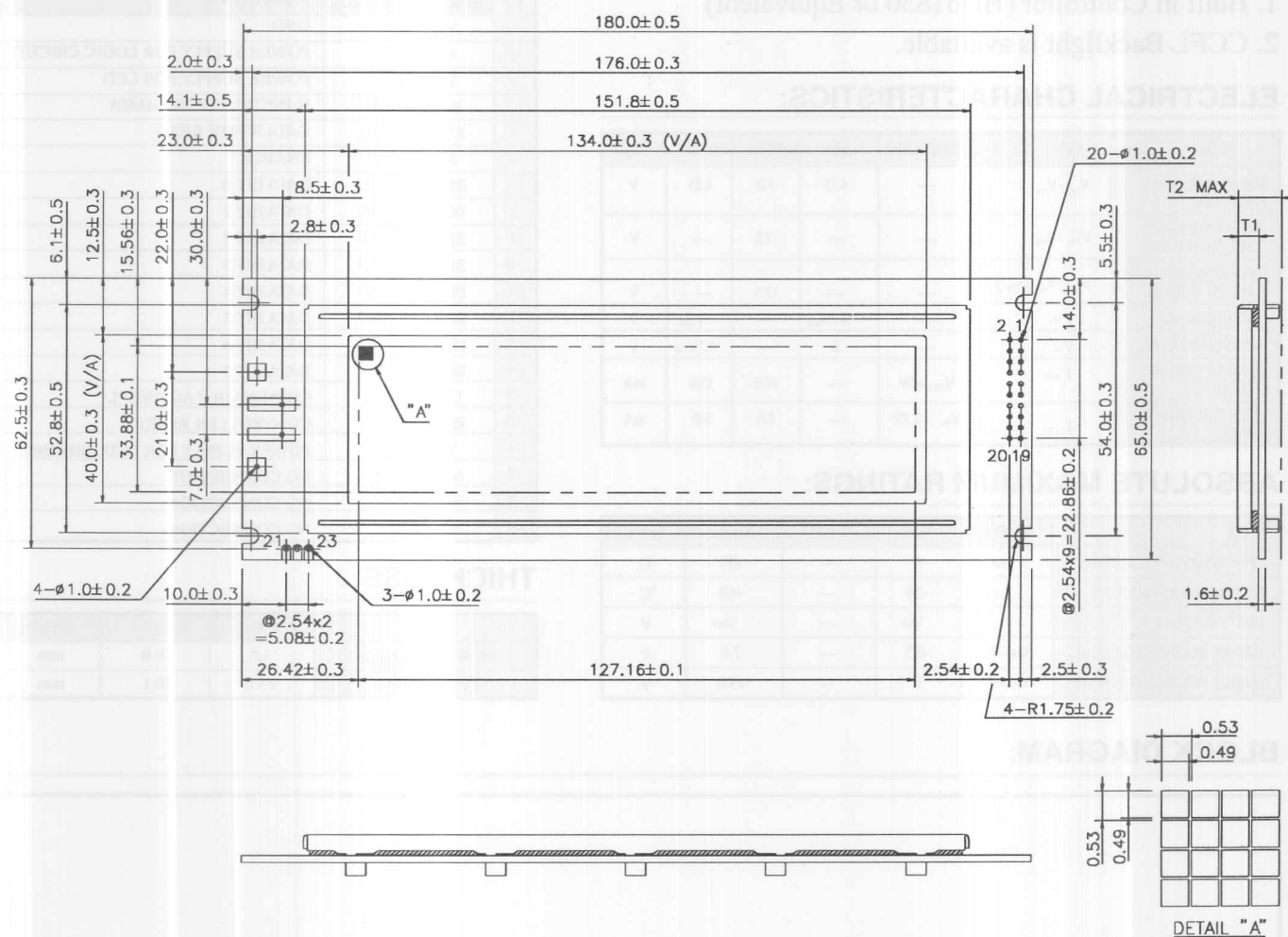
THICKNESS:

Version	T_1	T_2	UNIT
EL & NO Backlight	4.8	10.0	mm
LED Backlight	15.0	20.1	mm

BLOCK DIAGRAM:



OUTLINE DIMENSION:

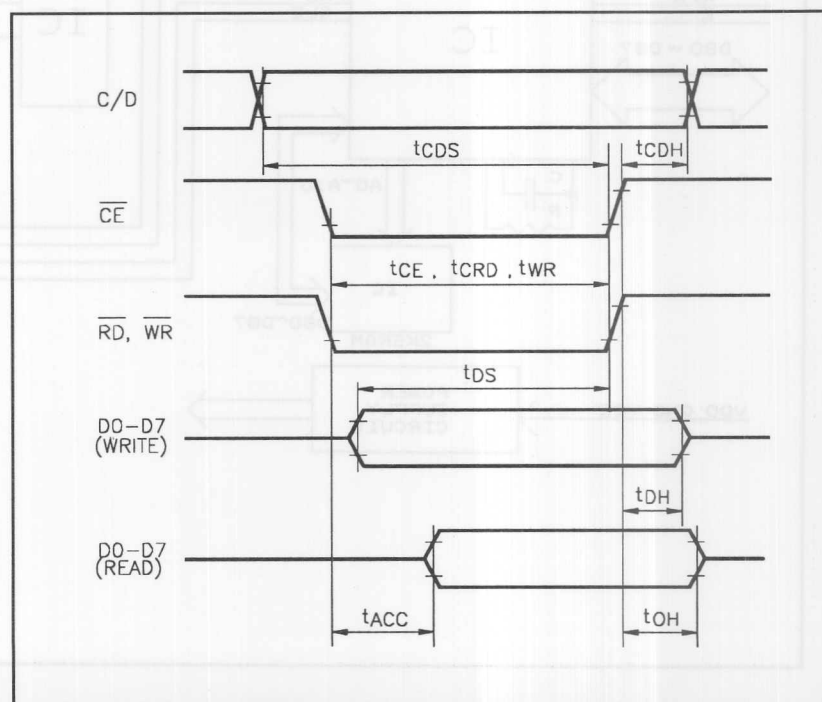


TIMING SPECIFICATIONS:

$V_{DD}=5.0V+10\%$, $V_{SS}=0V$

ITEM	SYMBOL	TEST CONDITION	MIN.	MAX.	UNIT
C/D Set Up Time	t_{CDS}		100	—	ns
C/D Hold Time	t_{CDH}		10	—	ns
CE, RD, WR Pulse Width	t_{CE}, t_{RD}, t_{WR}		80	—	ns
Data Set Up Time	t_{DS}		80	—	ns
Data Hold Time	t_{DH}		40	—	ns
Access Time	t_{ACC}		—	150	ns
Output Hold Time	t_{OH}		10	50	ns

TIMING CHART:



FEATURE:

1. Built in Controller (HD61830 or Equivalent)
2. CCFL Backlight is available.

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	----	4.75	5.0	5.25	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{EE}-V_{SS}$	----	----	-7.5	----	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_o (V_{op})$	----	----	12.5	----	V
INPUT HIGH VOL.	V_{IH}	----	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW LEVEL	V_{IL}	----	0	----	$0.3V_{DD}$	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5V$	----	10.0	15.0	mA
SUPPLY CURRENT FOR LCD	I_{LCD}	$V_o = -7.5V$	----	4.0	6.0	mA

ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T_{ST}	-20	---	+60	°C
INPUT VOLTAGE	V_i	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_o$	0	---	19.0	V

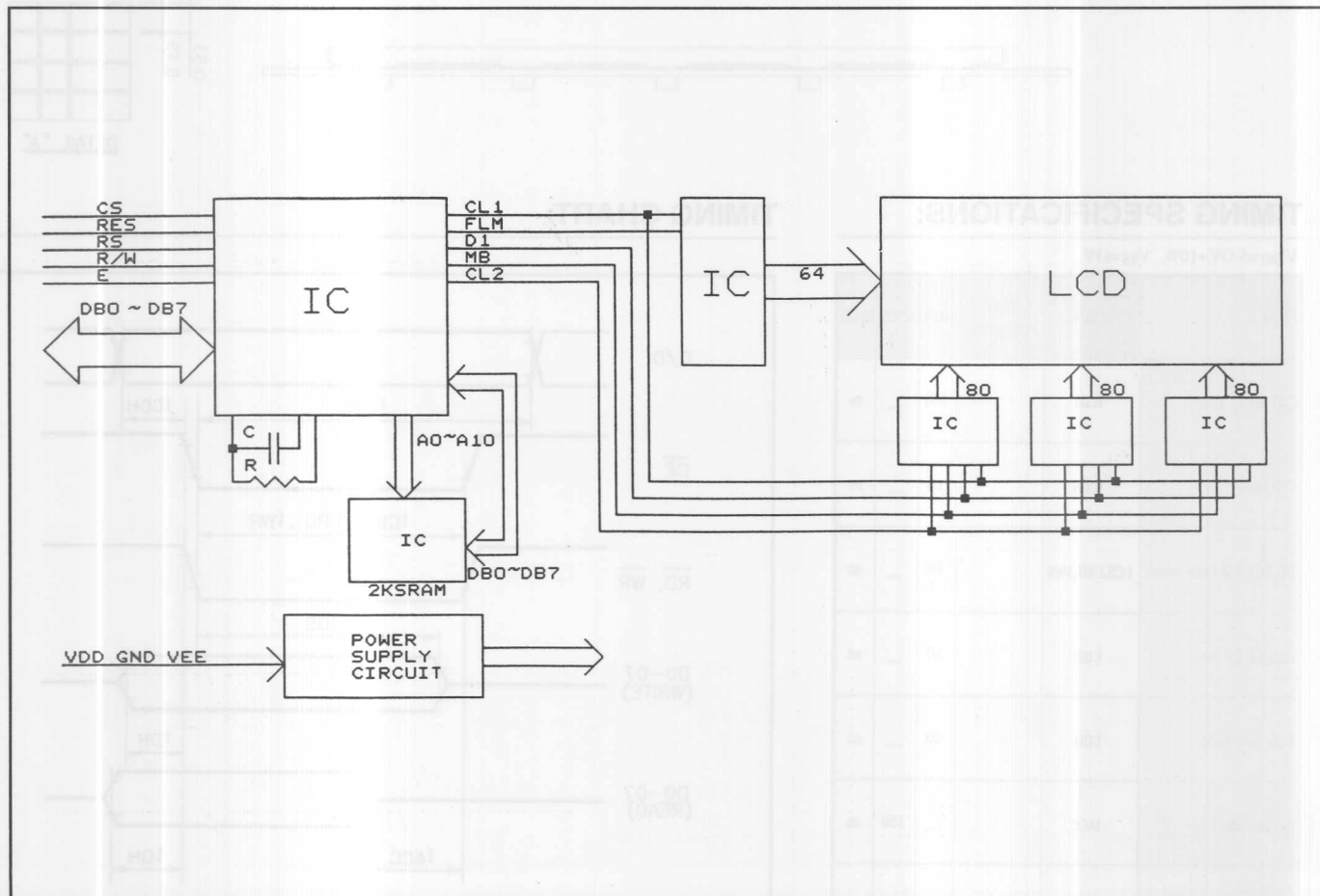
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	V_{SS}	-	GND
2	V_{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT
3	V_o	-	POWER SUPPLY FOR LCD
4	RS	H/L	H-INSTRUCTION L-DATA
5	R/W	H/L	DATA WRITE READ
6	E	H/L	ENABLE
7	DB0	I/O	DATA BIT 0
8	DB1	I/O	DATA BIT 1
9	DB2	I/O	DATA BIT 2
10	DB3	I/O	DATA BIT 3
11	DB4	I/O	DATA BIT 4
12	DB5	I/O	DATA BIT 5
13	DB6	I/O	DATA BIT 6
14	DB7	I/O	DATA BIT 7
15	CS	L	CHIP ENABLE ACTIVE "L"
16	RES	L	CONTROLLER RESET
17	V_{EE}	---	POWER SUPPLY FOR LCD DRIVING
18	NC	---	NO CONNECTION
19	NC	---	NO CONNECTION
20	NC	---	NO CONNECTION

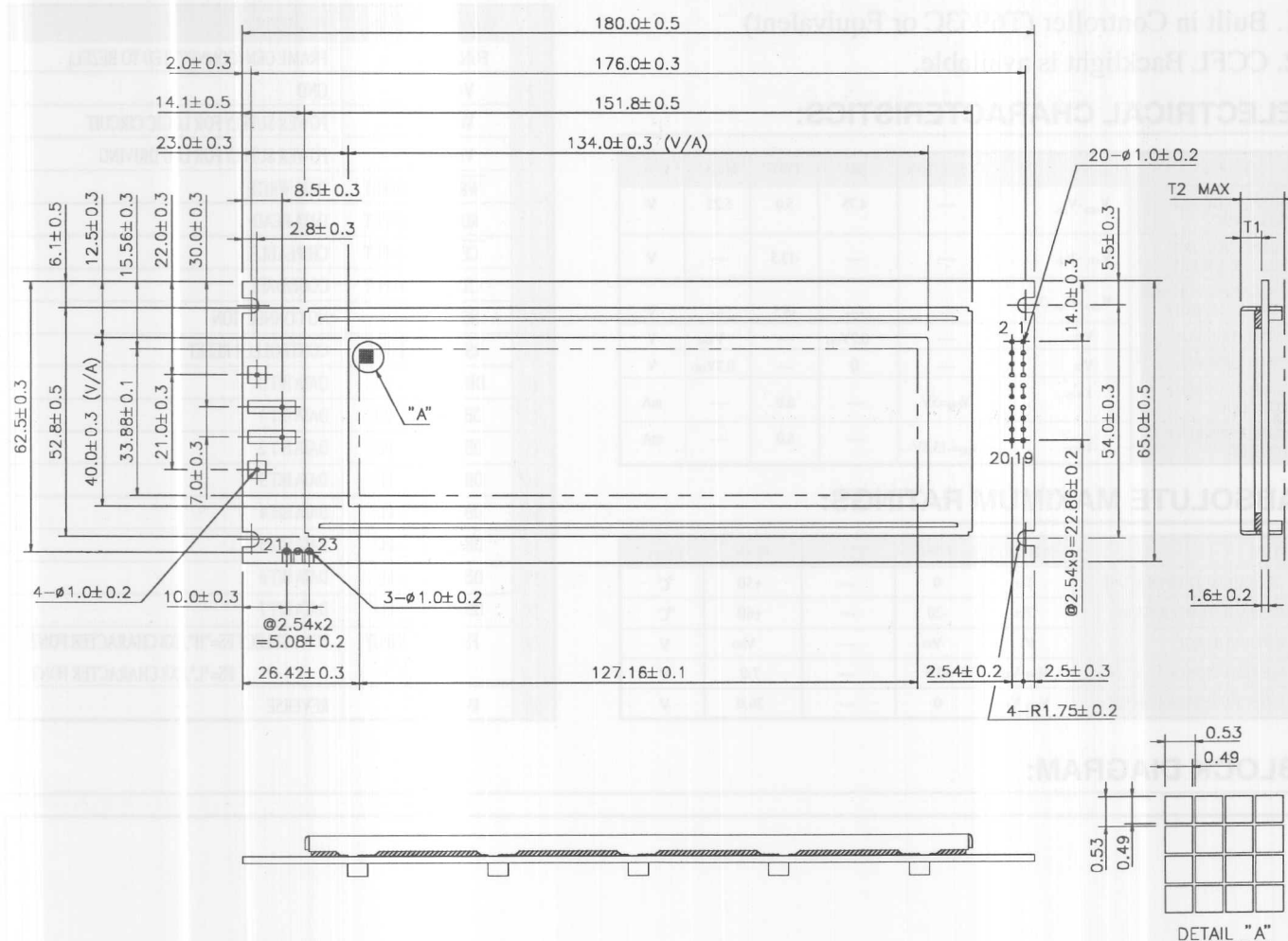
THICKNESS:

Version	T_1	T_2	UNIT
EL & NO Backlight	4.8	10.0	mm
LED Backlight	15.0	20.1	mm

BLOCK DIAGRAM:



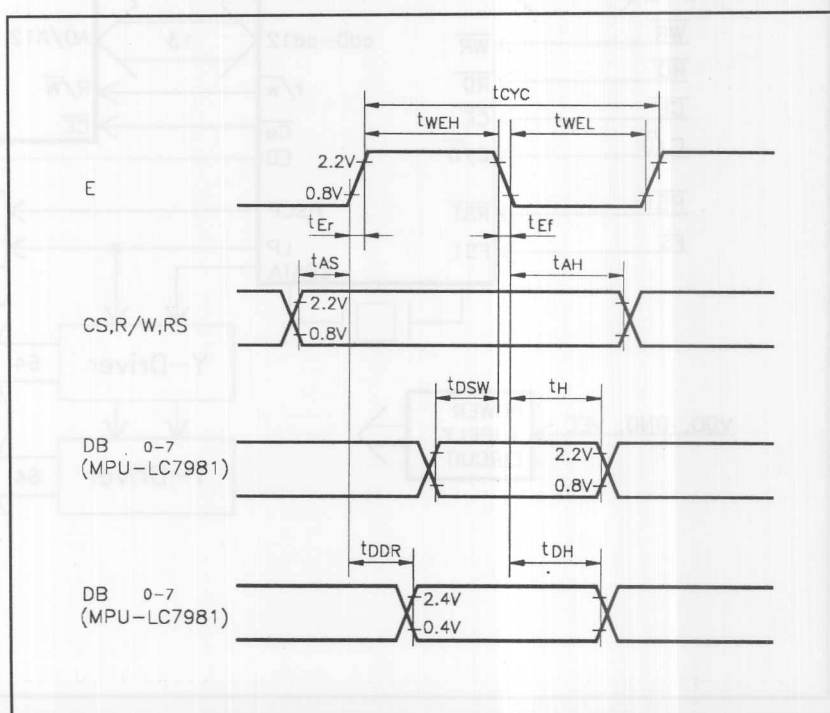
OUTLINE DIMENSION:



TIMING SPECIFICATIONS:

Item	Symbol	MIN	Typ	Max	Unit
E cycle time	t_{cyc}	1.0	—	—	ns
E high level width	T_{WEH}	0.45	—	—	ns
E low level width	T_{WEL}	0.45	—	—	ns
E rise time	t_{Er}	—	—	25	ns
E fall time	t_{Ef}	—	—	25	ns
Address setup time	t_{AS}	140	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data setup time	t_{DSW}	225	—	—	ns
Data delay time	t_{DDR}	—	—	225	ns
Data hold time (Write)	t_{DH}	20	—	—	ns
Data hold time (Read)	t_{H}	10	—	—	ns

TIMING CHART:



FEATURE:

1. Built in Controller (T6963C or Equivalent)
2. CCFL Backlight is available.

ELECTRICAL CHARACTERISTICS:

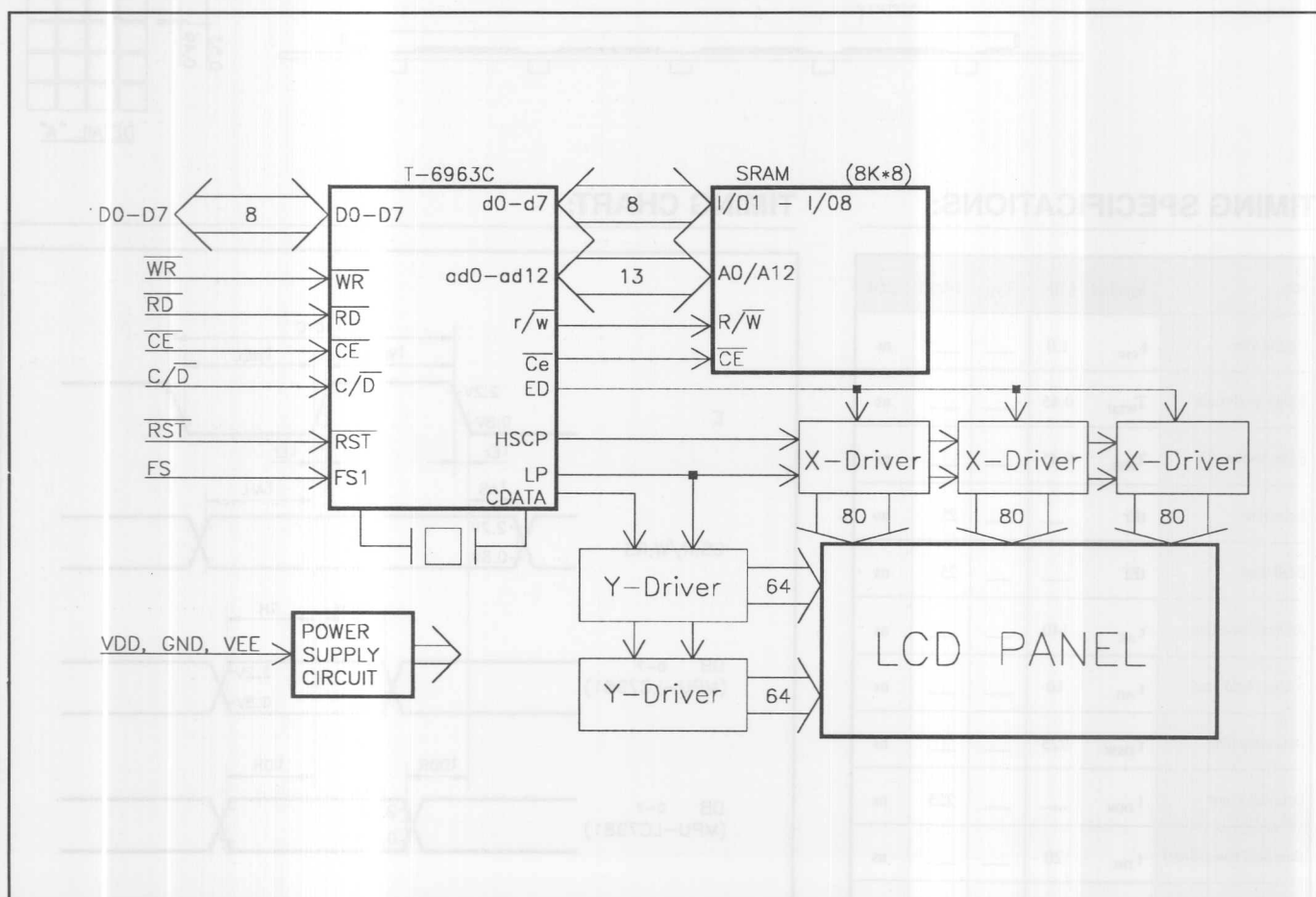
ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	----	4.75	5.0	5.25	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{IE}-V_{SS}$	----	----	-13.5	----	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_{SS} (V_{OP})$	----	----	18.5	----	V
INPUT HIGH VOL.	V_{IH}	----	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	$0.3V_{DD}$	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5V$	----	6.0	----	mA
SUPPLY CURRENT FOR LCD	I_{LCD}	$V_{IE}=-13.5V$	----	6.0	----	mA

ABSOLUTE MAXIMUM RATINGS:

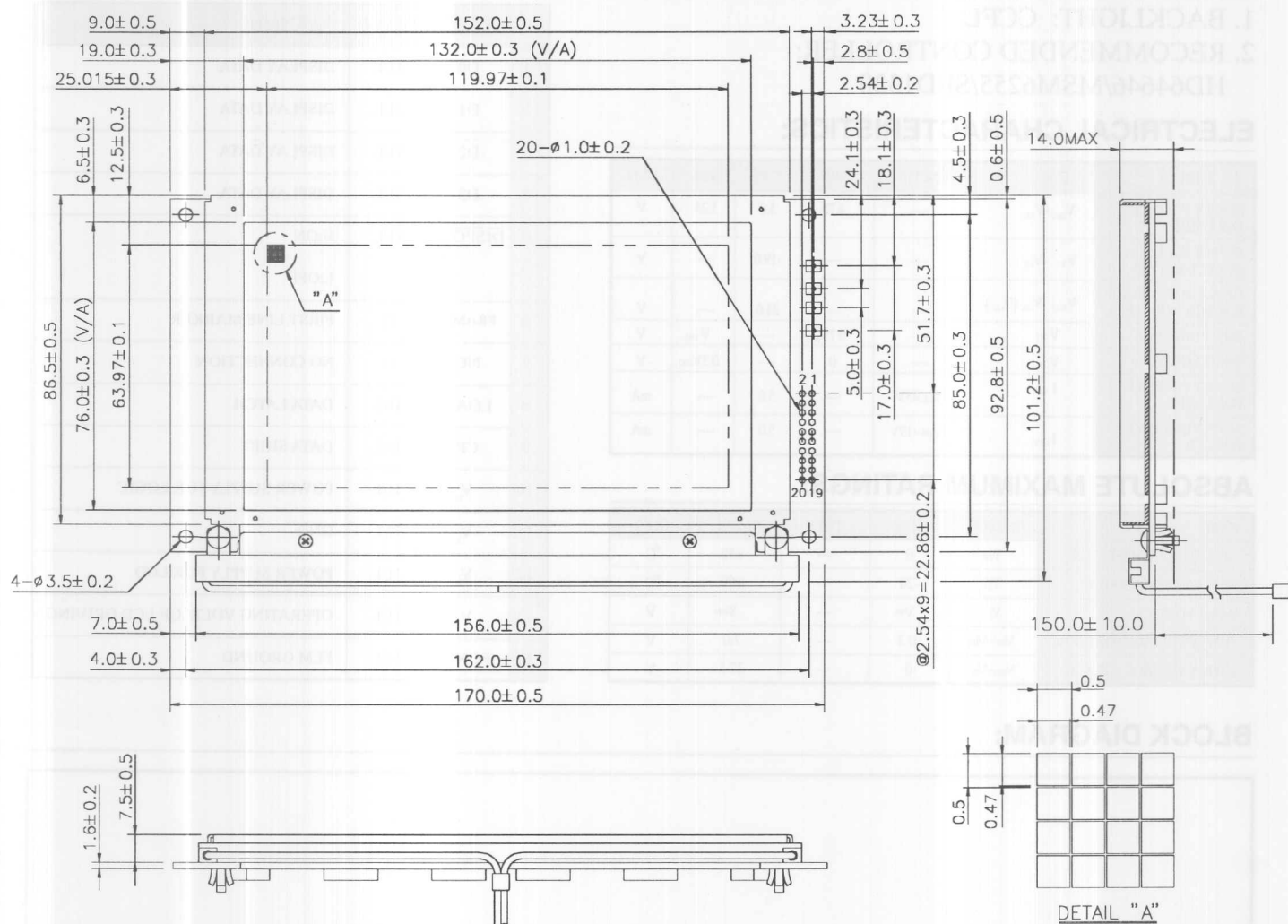
ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T_{ST}	-20	---	+60	°C
INPUT VOLTAGE	V_I	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	0	---	26.0	V

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	FGND	-	FRAME GEN (CONNECTED TO BEZEL)
2	V_{SS}	-	GND
3	V_{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT
4	V_{IE}	-	POWER SUPPLY FOR LCD DRIVING
5	WR	INPUT	DATA WRITE
6	RD	INPUT	DATA READ
7	CE	INPUT	CHIPEABLE
8	C/D	INPUT	CODE/DATE
9	NC	-	NO CONNECTION
10	RST	INPUT	CONTROLLER RESET
11	DB0	I/O	DATA BIT 0
12	DB1	I/O	DATA BIT 1
13	DB2	I/O	DATA BIT 2
14	DB3	I/O	DATA BIT 3
15	DB4	I/O	DATA BIT 4
16	DB5	I/O	DATA BIT 5
17	DB6	I/O	DATA BIT 6
18	DB7	I/O	DATA BIT 7
19	FS	INPUT	FONT SELECT FS="H", 6X8 CHARACTER FONT FS="L", 8X8 CHARACTER FONT
20	RV	-	REVERSE

BLOCK DIAGRAM:

OUTLINE DIMENSION:

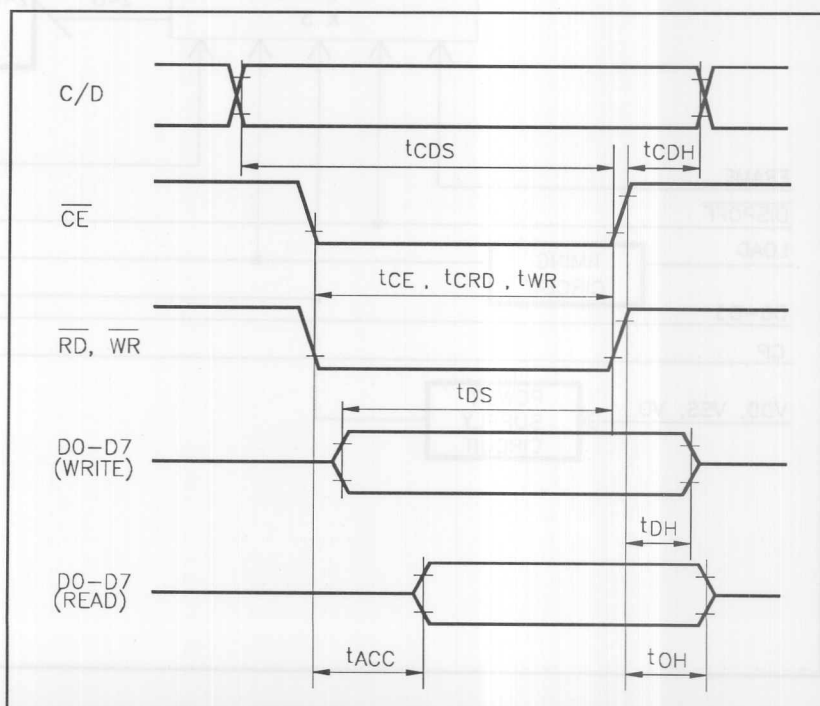


TIMING SPECIFICATIONS:

$$V_{DD}=5.0V+10\%, \quad V_{SS}=0V$$

ITEM	SYMBOL	TEST CONDITION	MIN.	MAX.	UNIT
C/D Set Up Time	tCDS		100	—	ns
C/D Hold Time	tCDH		10	—	ns
CE, RD, WR Pulse Width	tCE, tRD, tWR		80	—	ns
Data Set Up Time	tDS		80	—	ns
Data Hold Time	tDH		40	—	ns
Access Time	tACC		—	150	ns
Output Hold Time	tOH		10	50	ns

TIMING CHART:



FEATURE:

- 1. BACKLIGHT: CCFL
- 2. RECOMMENDED CONTROLLER: HD64646/MSM6255/SED1330

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	----	4.75	5.0	5.25	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{IE}-V_{SS}$	----	----	-19.0	----	V
OPERATING VOLTAGE FOR LCD MODULE	$V_{DD}-V_{SS} (V_{OP})$	----	----	24.0	----	V
INPUT HIGH VOL.	V_{IH}	----	$0.7V_{DD}$	----	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	0	----	$0.3V_{DD}$	V
SUPPLY CURRENT FOR LOGIC	I_{DD}	$V_{DD}=5V$	----	5.0	----	mA
SUPPLY CURRENT FOR LCD	I_{LCD}	$V_{IE}=-19V$	----	5.0	----	mA

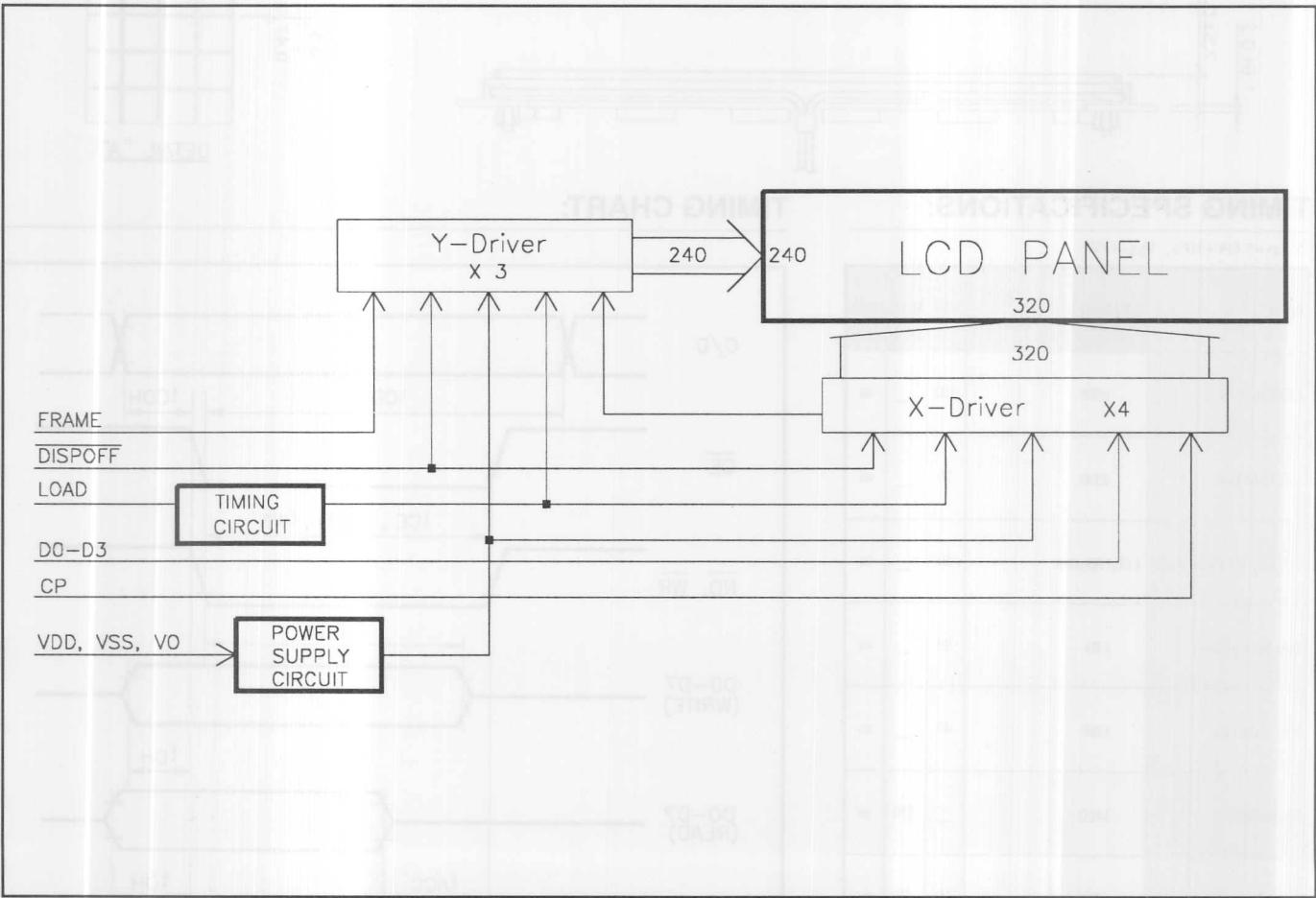
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T_{ST}	-20	---	+60	°C
INPUT VOLTAGE	V_i	V_{SS}	---	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	$V_{DD}-V_{SS}$	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	$V_{DD}-V_0$	0	---	27.5	V

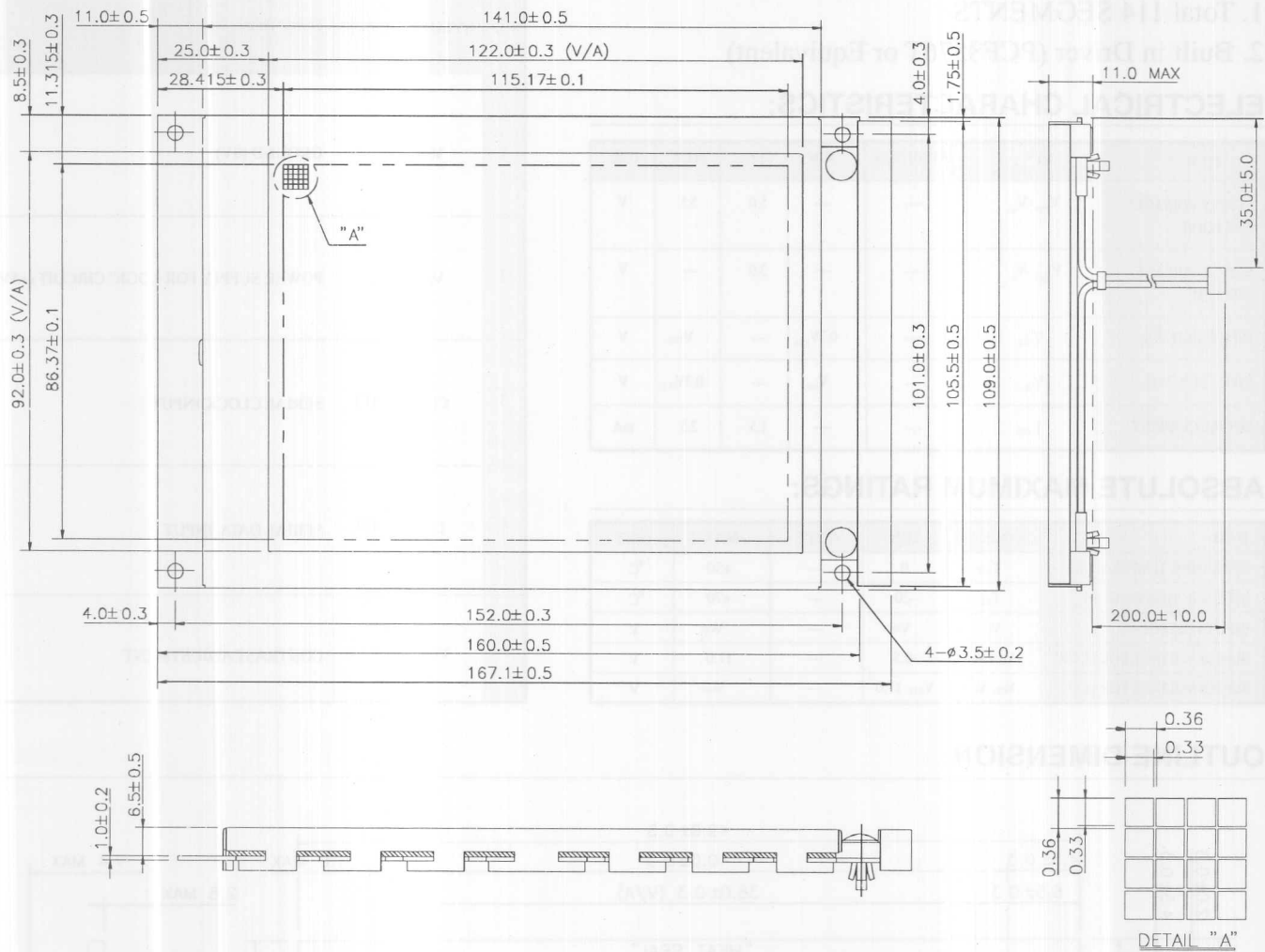
INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	D0	H/L	DISPLAY DATA
2	D1	H/L	DISPLAY DATA
3	D2	H/L	DISPLAY DATA
4	D3	H/L	DISPLAY DATA
5	$\overline{DISPOFF}$	H/L	H:ON L:OFF
6	FRAME	H	FIRST LINE MARKER
7	NC	---	NO CONNECTION
8	LOAD	H/L	DATA LATCH
9	CP	H/L	DATA SHIFT
10	V_{DD}	H/L	POWER SUPPLY FOR LOGIC
11	V_{SS}	H/L	GND
12	V_{IE}	H/L	POWER SUPPLY FOR LCD
13	V_0	H/L	OPERATING VOLTAGE LCD DRIVING
14	FGND	H/L	FLM GROUND

BLOCK DIAGRAM:



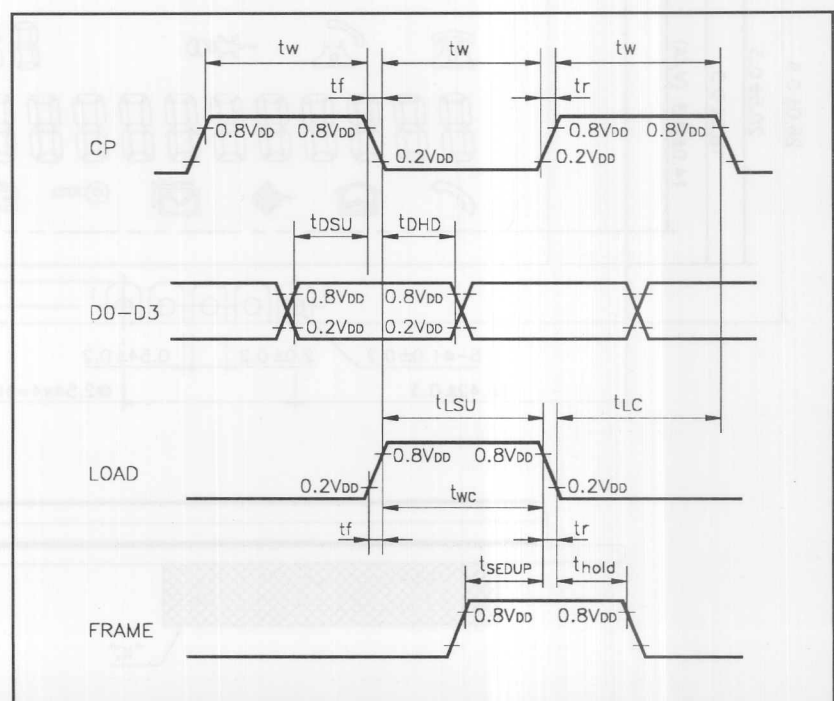
OUTLINE DIMENSION:



TIMING SPECIFICATIONS:

Item	Symbol	MIN.	Typ	MAX.	UNIT
Clock Frequency	f_{cp}	—	—	6.5	MHZ
Clock pulse width	t_w	63	—	—	ns
Rise, fall time	t_r, t_f	—	—	20	ns
Data set up time	t_{DSU}	50	—	—	ns
Data hold time	t_{DHD}	50	—	—	ns
Load set up time	t_{LSU}	80	—	—	ns
Load→Clock time	t_{LC}	80	—	—	ns
FRAME set up time	t_{SETUP}	100	—	—	ns
FRAME hold time	t_{hold}	100	—	—	ns
Clock load pulse width	t_{wc}	125	—	—	ns

TIMING CHART:



INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	V _{SS}	-	GROUND (0V)
2	V _{DD}	-	POWER SUPPLY FOR LOGIC CIRCUIT (+5V)
3	CL	H/L	SERIAL CLOCK INPUT
4	D	H/L	SERIAL DATA INPUT
5	VO	-	CONTRAST ADJUSTMENT

[illegible]

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD-VSS}	-0.5	---	11.0	V
SUPPLY VOLTAGE FOR LCD	V _{DD-V₀}	V _{DD} -11.0	---	V _{DD}	V



FEATURE:

1. Total 117 SEGMENTS
2. Built in Driver (SED1510DOC or Equivalent)

ELECTRICAL CHARACTERISTICS:

ITEM	SYN	CONDITION	MIN	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	$V_{DD} - V_{SS}$	$T_a = 25^{\circ}C$	2.7	5.0	5.5	V
SUPPLY VOLTAGE FOR LCD DRIVER	$V_{DD} - V_0$	$T_a = 25^{\circ}C$	----	3.5	---	V
INPUT VOLTAGE	V_I	----	V_{SS}	---	V_{DD}	V
INPUT HIGH VOL.	V_{IH}	----	$0.8V_{DD}$	---	V_{DD}	V
INPUT LOW VOL.	V_{IL}	----	V_{SS}	---	$0.2V_{DD}$	V
SUPPLY CURRENT	I_{DD}	----	----	1.5	2.5	mA

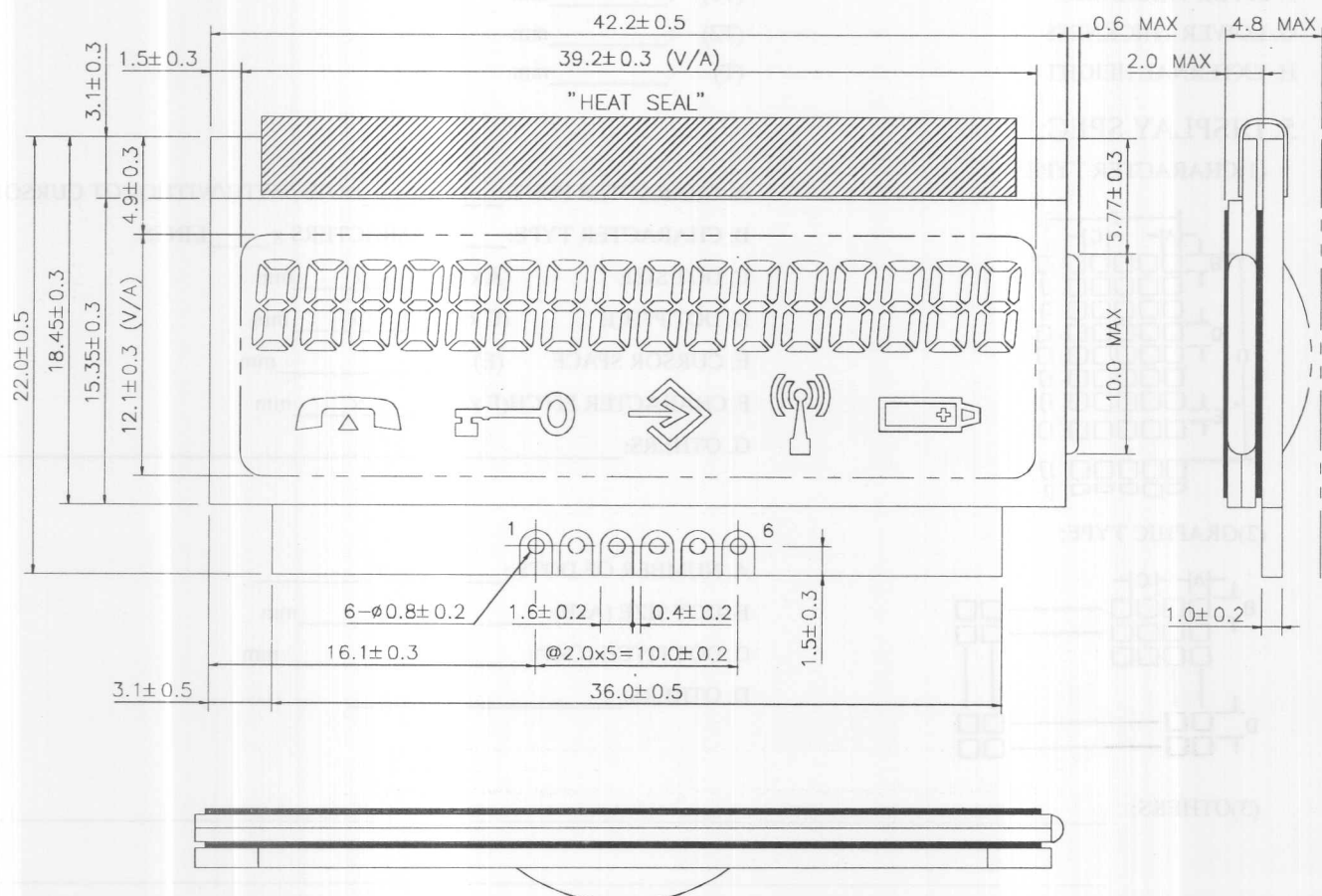
ABSOLUTE MAXIMUM RATINGS:

ITEM	SYMBOL	MIN	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	T _{OP}	0	---	+50	°C
STORAGE TEMPERATURE	T _{ST}	-20	---	+70	°C
INPUT VOLTAGE	V _I	V _{SS}	---	V _{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V _{DD} -V _{SS}	-0.3	---	7.0	V
SUPPLY VOLTAGE FOR LCD	V _{DD} -V ₀	0	---	7.0	V

INTERFACE PIN CONNECTIONS:

NO	SYMBOL	LEVEL	FUNCTION
1	V_{DD}	-	VCC(+5V)
2	V_{SS}	-	GROUND (0V)
3	SI	H/L	SERIAL DATA INPUT
4	CK	H/L	SERIAL DATA CLOCK INPUT
5	$\overline{C/D}$	H/L	COMMAND/DATA SELECT INPUT
6	\overline{CS}	H/L	ACTIVE-LOW CHIP SELECT INPUT

OUTLINE DIMENSION:



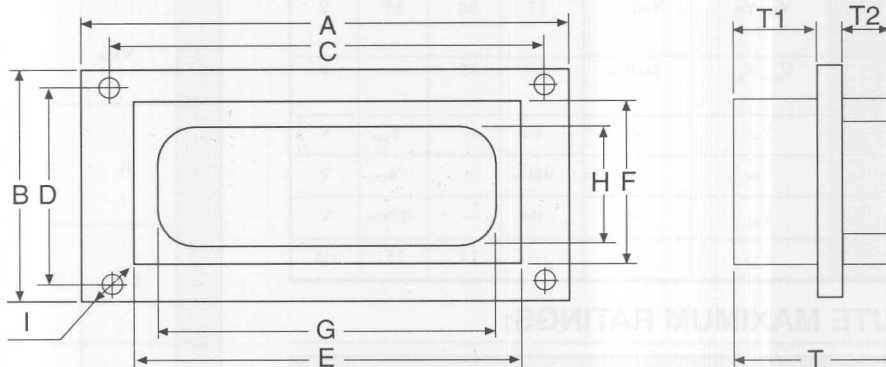
CHECK LIST FOR LCD MODULE

1. CUSTOMER: _____

2. PRODUCT NO: _____

3. APPLICATION: _____

4. DIMENSIONS:



A. OUTLINE DIMENSION

(AxB) : _____ x _____ mm

B. MOUNTING HOLE LOCATION

(Cx D) : _____ x _____ mm

C. HOLDER SIZE

(Ex F) : _____ x _____ mm

D. VIEW AREA

(Gx H) : _____ x _____ mm

E. DIAMETER OF MOUNTING HOLE

(I) : _____ x _____ mm

F. UPPER THICKNESS

(T1) : _____ mm

G. LOWER THICKNESS

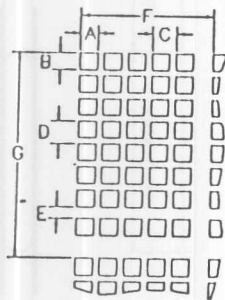
(T2) : _____ mm

H. EXTERNAL HEIGHT

(T) : _____ mm

5. DISPLAY SPEC:

(1) CHARACTER TYPE:



A. CHARACTER FONT: _____ x _____ DOTS, WITH/WITHOUT CURSOR.

B. CHARACTER TYPE: _____ CHARACTERS x _____ LINES.

C. DOT SIZE (A x B): _____ x _____ mm

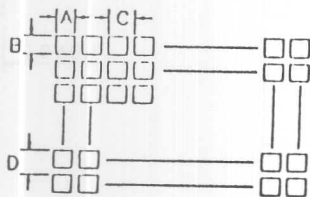
D. DOT PITCH (C x D): _____ x _____ mm

E. CURSOR SPACE (E) : _____ mm

F. CHARACTER PITCH (F x G): _____ x _____ mm

G. OTHERS: _____

(2) GRAPHIC TYPE:



A. NUMBER OF DOTS : _____ x _____

B. DOT SIZE (AxB): _____ x _____ mm

C. DOT PITCH (Cx D): _____ x _____ mm

D. OTHERS: _____

(3) OTHERS: _____

6.EXTERNAL CONNECTION METHOD:

☐ PATTERN TERMINAL ☐ CONNECTOR: _____ ☐ OTHERS: _____

7. LCD SPEC:

A.VIEW ANGLE: ☐ 6 O'CLOCK ☐ 12 O'CLOCK ☐ _____ O'CLOCK

B. LCD TYPE: ☐ TN ☐ STN YELLOW ☐ STN GRAY
☐ STN BLUE ☐ FSTN B/W ☐ OTHER
☐ REFLECTIVE ☐ TRANSFLECTIVE ☐ TRANSMISSIVE
☐ POSITIVE TYPE ☐ NEGATIVE TYPE

C.VISUAL SPEC.: ☐ NORMAL ☐ ANTI-GLARE ☐ _____

8. IC:

A. COMMON DRIVER: _____

B. SEGMENT DRIVER: _____

C. CONTROLLER: _____ ☐ BUILT-IN ☐ EXTERNAL

D. OTHERS: _____

9.DRIVING METHOD:

☐ STATIC
☐ MULTIPLEXING Duty: _____

10.POWER SOURCE:

A. SUPPLY VOLTAGE FOR LOGIC: ☐ 5V ☐ 3V ☐ _____ V

B. SUPPLY VOLTAGE FOR LCD : _____ V

11.BACKLIGHT:

A. ☐ NO BACKLIGHT

B. BACKLIGHT TYPE: ☐ LED ☐ EL ☐ CCFL ☐ _____

C. BACKLIGHT COLOR: ☐ YELLOW ☐ GREEN ☐ AMBER ☐ RED
☐ BLUE ☐ WHITE ☐ _____

12. TEMPERATURE RANGE:

A.OPERATING TEMPERATURE: ☐ 0°C~50°C ☐ _____°C ~ _____°C

B.STORAGE TEMPERATURE: ☐ -20°C~60°C ☐ _____°C ~ _____°C

13.SCHEDULE:

A. ESTIMATE: _____

B. SAMPLE:

DELIVERY: _____ QUANTITY: _____ PCS

C. MASS PRODUCTION:

DELIVERY: _____ QUANTITY PER MONTH: _____ PCS

TOTAL QUANTITY: _____ PCS

14. OTHER CONDITIONS: _____

▼ Introduction...

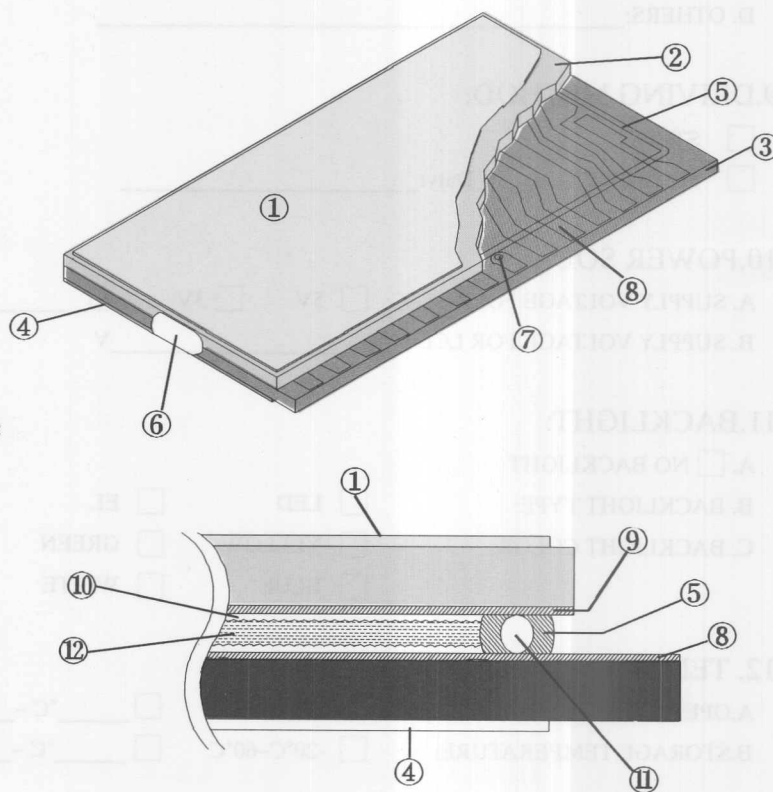
The LCD (Liquid Crystal Display) is formed with 6~10 μ m thick nematic Liquid crystal sandwiched between two glass plates with transparent electrode patterns, and polarizers stationed on the outside of the two glass plates.

▼ Features...

1. Light and thin in LCD products.
2. Low power consumption for LCD driver.
3. Could display various patterns and figures.
4. Good contrast and wide viewing angle.
5. Easy mounting and assembly.
6. Wide applications in various fields, such as clock, watch, instruments, OA machine, pager, car stereo, data bank, translator, calculator, game, etc.

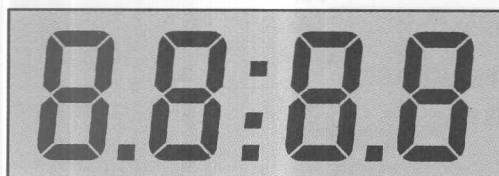
▼ Fundamental structure...

- ① Front Polarizer
- ② Front Glass
- ③ Rear Glass
- ④ Rear Polarizer
- ⑤ Seal Adhesive
- ⑥ Inletting Seal Adhesive
- ⑦ Transfer (Ag Paste)
- ⑧ Transparent Electrode
- ⑩ Alignment Film
- ⑪ Spacer
- ⑫ Liquid Crystal



▼ Type of display...

■ Positive type



*Ambient light is necessary to use this type.

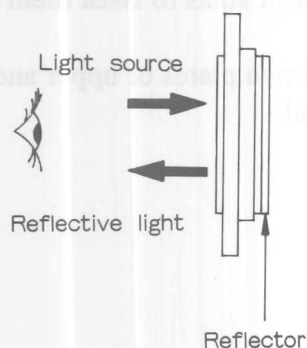
■ Negative type



*Negative type is most applicable for back-lighting system and is capable of multi-color display.

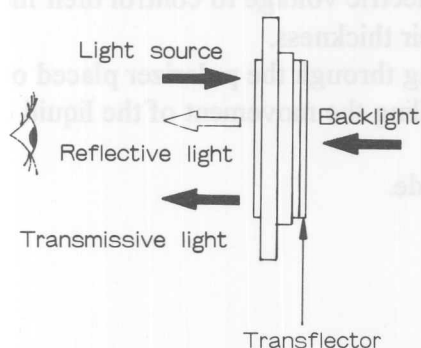
▼ Lighting methods...

(1) Reflective Mode



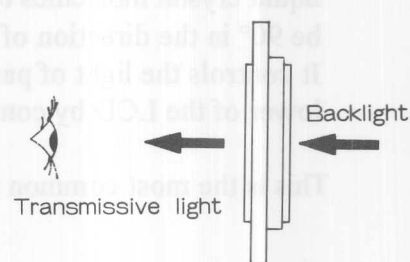
*Ambient light is necessary to use this type .

(2) Transflective Mode



*Ambient light is taken from the outside during day or in the dark and a back-light is used in the dark .

(3) Transmissive Mode



*A back-light is always used .

▼ Connector and Mounting methods...

LCD MOUNTING METHODS (EXAMPLE)	CONNECTOR	DESCRIPTION
		<ol style="list-style-type: none"> 1.Connect LCD and PCB by mechanical compression. 2.Easy to assemble. 3.Adopted for many years. 4.Applicable even to narrow pads.(0.4mm on pitch MIN.)
		<ol style="list-style-type: none"> 1.Connecting method : Heat and pressure fitting, soldering or mechanical compression . 2.A thin structure can be achieved . 3.Possible to bend . 4.Free trimming possible . 5.pitch : Heat seal 0.4mm min soldering type 0.8mm min.
		<ol style="list-style-type: none"> 1.Metal pins fit onto the panel terminal pad. 2.Connect to PCB by soldering. 3.Suitable for small production runs. 4.Standard pitch : 1.8, 2.0, 2.54 mm on pin

▼TN mode

This is the Twisted Nematic (TN) Liquid crystal display. It is the mode which arranges the liquid crystal molecules by electric voltage to control their movement so as to twist them to be 90° in the direction of their thickness.

It controls the light of passing through the polarizer placed on the two plates of upper and lower of the LCD by controlling the movement of the liquid crystal.

This is the most common mode.

▼HTN mode

This is the High performance Twisted Nematic (HTN) liquid crystal display. Its performance is between the TN and STN. The viewing angle of HTN is wider than TN, especially for high duty display. When the LCD is used in 1/9 Duty~1/32 Duty the HTN is the best choice.

HTN's price is much cheaper than STN, but its beautiful yellow color background appeals to its user.

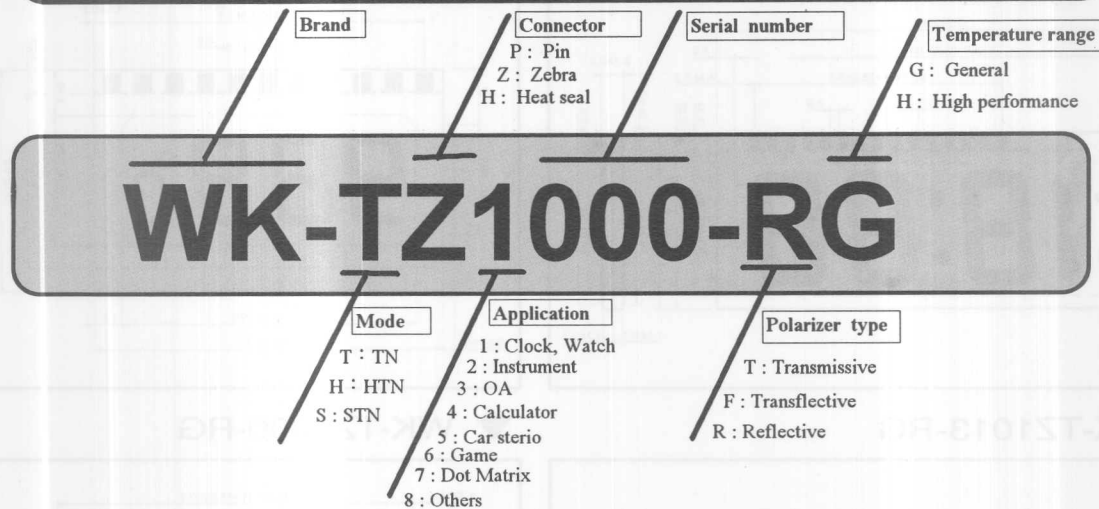
Comparison of TN and HTN as below:

Mode	Duty Cycles	Operating Voltage	Viewing Angle		Response Time (25°C)	Contrast	Remark
			θ	ϕ			
TN	1/9D, 1/4B	3 ~ 4.5	10°~ 45°	±30°	200 ~ 300 ms	2 ~ 15	
	1/16D, 1/5B	3.5 ~ 5	10°~ 40°	±25°	200 ~ 300 ms	2 ~ 12	
	1/32D, 1/6.67B	5 ~ 7	very narrow			below 4	
HTN	1/9D, 1/4B	3 ~ 4.5	10°~ 45°	±45°	250 ~ 350 ms	6 ~ 14	
	1/16D, 1/5B	3.5 ~ 5	10°~ 45°	±45°	250 ~ 350 ms	4 ~ 10	
	1/32D, 1/6.67B	5 ~ 7	10°~ 45°	±45°	250 ~ 350 ms	3 ~ 8	

▼STN mode

This is the Super Twisted Nematic (STN) liquid crystal display, The structure of the STN mode is the same as that of TN mode. The twist angle of STN ranges from 180° to 270° ; therefore, STN mode has its excellent viewing angle and good contrast.

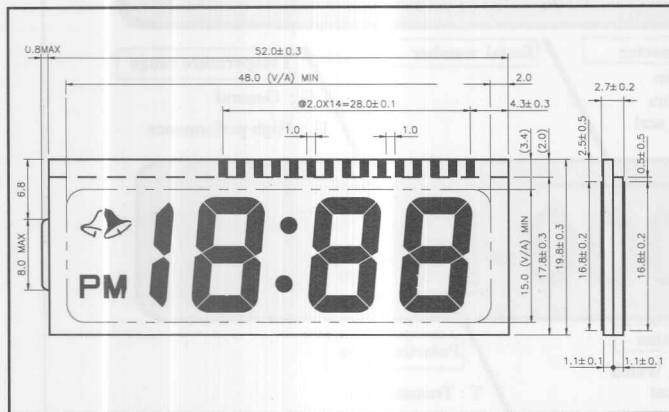
PRODUCTS ORDERING INFORMATION



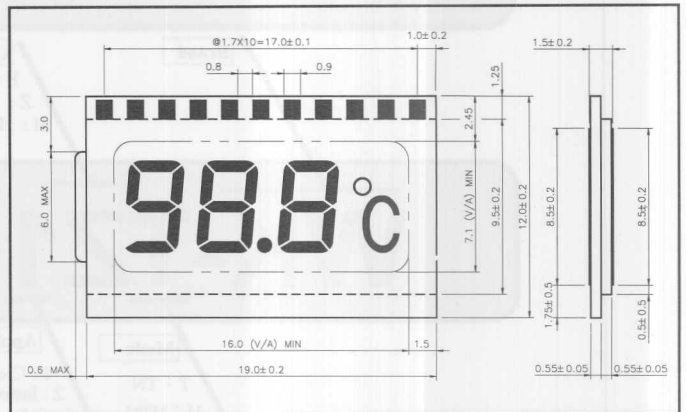
■ STANDARD MODEL :

MODEL NO.	GLASS SIZE	VIEW AREA	DUTY	BIAS	VOLTAGE	MATCHING LSI	APPLICATION
WK-TZ1000-RG	52.0x19.8	48.0x15.0	1/2	1/2	3.0V	KS5199,MSM5004	CLOCK
WK-TZ1013-RG	52.0x22.0	48.0x15.8	1/2	1/2	3.0V	KS5159,MSM5004	CLOCK
WK-TZ1023-RG	52.0x27.5	47.0x21.5	1/2	1/2	3.0V	KS5199,MSM5004	CLOCK
WK-TZ1028-RG	40.0x16.0	37.0x11.0	1/3	1/3	3.0V	KS5112,MSM5006	CLOCK
WK-TZ1113-RG	19.0x12.0	16.0x7.1	1/3	1/2	3.0V	PCF8576	THERMOMETER
WK-TP2000-RG	50.8x30.48	46.8x16.48	STATIC		3.0V	ICL7106,UPD7225	MULTIMETER
WK-TZ2010-RG	20.4x10.0	18.0x6.0	1/2	1/2	3.0V	LC7582,UPD7225	COUNTER
WK-TP2169-FG	50.8x30.48	46.8x16.48	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2763-RG	50.8x22.86	44.45x11.43	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2764-RG	50.8x30.48	44.45x16.51	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2765-RG	69.85x38.1	63.5x24.13	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2766-RG	50.8x30.48	44.45x16.51	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2767-RG	50.8x30.48	44.45x18.4	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2768-RG	69.85x38.1	65.79x26.04	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2769-RG	50.8x22.86	44.45x11.43	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2770-RG	50.8x30.48	44.45x16.51	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2771-RG	93.85x45.72	87.0x31.75	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TZ2772-RG	38.0x20.3	34.0x12.0	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TZ2773-RG	37.0x18.5	30.0x14.0	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TP2774-RG	69.85x30.48	64.77x17.78	STATIC		3.0V	LC7582,MSM5219	MULTIMETER
WK-TZ3001-RG	54.0x18.5	50.6x12.6	1/4	1/3	3.0V	PCF8576,UPD7225	COUNTER,TEL
WK-TH3017-FG	38.0x13.4	34.6x8.4	1/4	1/3	2.5V		PAGER
WK-TH3018-FG	49.0x16.5	45.0x10.5	1/4	1/3	3.0V		PAGER
WK-TH3019-FG	39.0x10.5	36.0x6.1	1/4	1/3	3.0V		PAGER
WK-TH3024-FG	39.0x10.5	36.0x6.1	1/4	1/3	3.0V		PAGER
WK-TZ4000-RG	40.0x19.0	37.0x13.9	1/3	1/2	2.95V		CALCULATOR
WK-TZ4001-RG	50.0x15.0	45.0x8.9	1/3	1/2	3.0V		CALCULATOR
WK-TZ4004-RG	60.0x18.4	55.0x11.9	1/3	1/2	2.85V	KS6325,LI3160	CALCULATOR
WK-TZ4008-RG	60.0x25.0	56.6x19.1	1/3	1/2	2.95V		CALCULATOR
WK-TZ4023-RG	47.5x18.2	43.9x12.2	1/3	1/2	3.0V	KS6325,LI3160	CALCULATOR
WK-TZ4026-RG	75.0x25.0	71.0x18.5	1/3	1/2	2.85V	KS6078	CALCULATOR
WK-TZ4039-RG	109.0x31.5	103.0x23.0	1/3	1/2	2.9V	KS6078	CALCULATOR
WK-TZ4084-RG	109.0x31.5	103.0x23.0	1/3	1/2	2.95V	KS6078	CALCULATOR
WK-TP5004-RG	69.0x20.5	65.0x14.0	1/4	1/3	5.0V	CXP1011	CD,CAR STERIO
WK-TP5005-RG	69.0x20.5	65.0x14.0	1/4	1/3	5.0V	CXP1011	CD,CAR STERIO
WK-TP5008-TG	52.0x18.0	48.0x11.5	1/2	1/2	5.0V	UPD1723	CD,CAR STERIO
WK-TP5043-RG	58.8x19.8	54.9x13.5	1/4	1/3	5.0V	T9307,UPD16430	CD,CAR STERIO
WK-TP5044-FG	69.0x20.5	65.0x14.0	1/4	1/3	5.0V	T9307,UPD16430	CD,CAR STERIO
WK-TZ6045-TG	42.0x54.0	34.0x49.0	1/8	1/5	4.5V	HT-1161,HT-1162	GAME
WK-TZ6046-TG	42.0x54.0	34.0x50.0	1/8	1/5	3.0V		GAME
WK-TZ6097-TG	42.0x54.0	34.0x50.0	1/8	1/4	4.5V		GAME
WK-TZ7001-RG	70.0x22.6	64.7x14.5	1/16	1/5	4.5V	HD44780	TRANSLATER
WK-TZ7003-RG	70.0x22.6	64.7x13.3	1/16	1/5	4.5V	HD44780	TRANSLATER
WK-TZ7004-RG	93.85x38.1	77.85x25.2	1/16	1/5	4.5V	HD44780	TRANSLATER
WK-TZ7005-RG	159.7x27.6	154.5x16.5	1/16	1/5	4.5V	HD44780	TRANSLATER
WK-TZ7006-RG	70.0x25.0	62.5x16.5	1/16	1/5	4.5V	HD44780	TRANSLATER
WK-SZ7020-RG	80.7x50.4	72.0x39.0	1/64	1/9	9.18V	HD61202	TRANSLATER
WK-TZ7023-RG	101.5x26.8	94.5x18.0	1/16	1/5	4.5V	HD44780	TRANSLATER

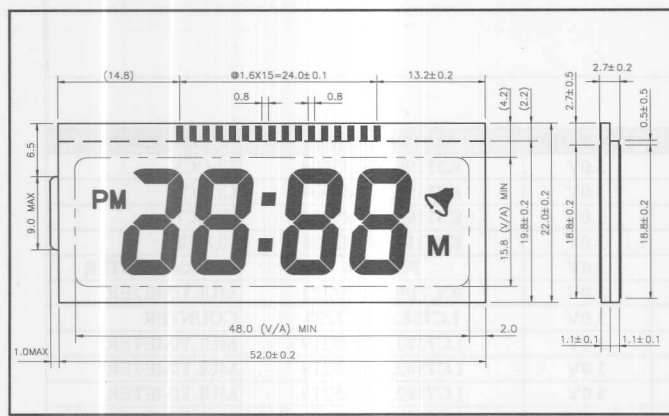
▼ WK-TZ1000-RG



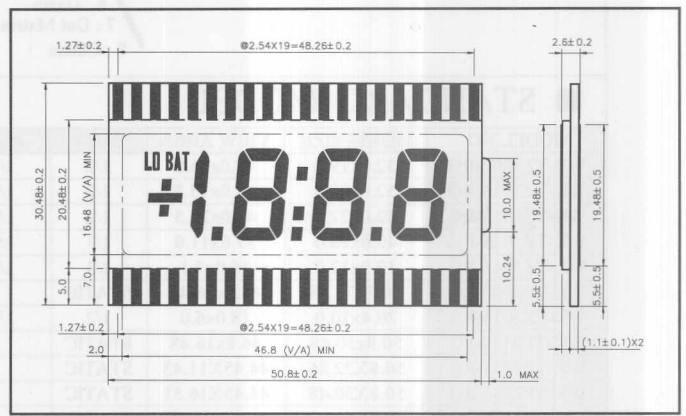
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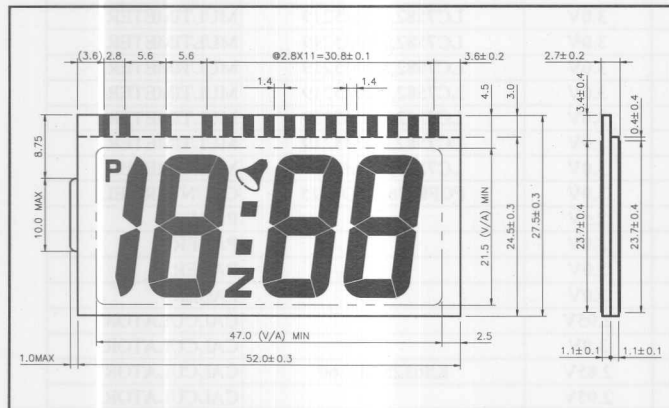
▼ WK-TZ1013-RG



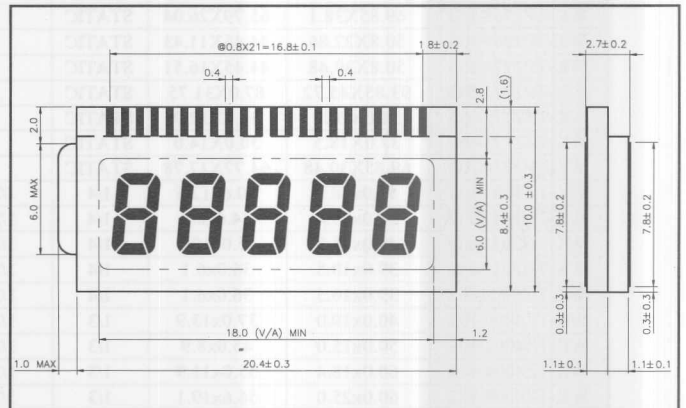
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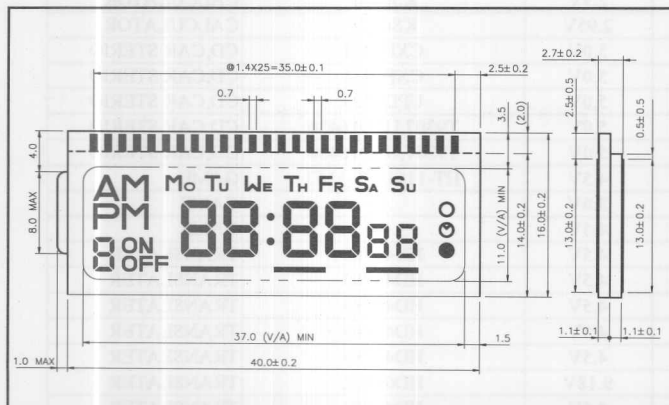
▼ WK-TZ1023-RG



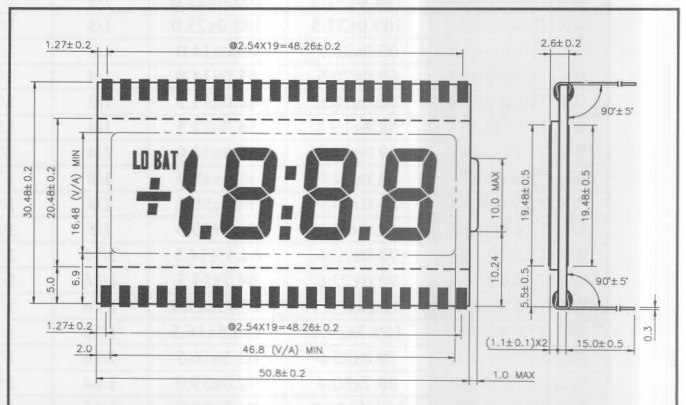
▼ WK-TZ2010-RG



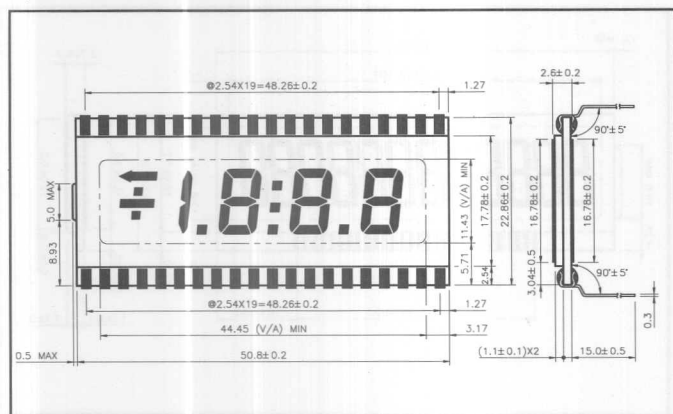
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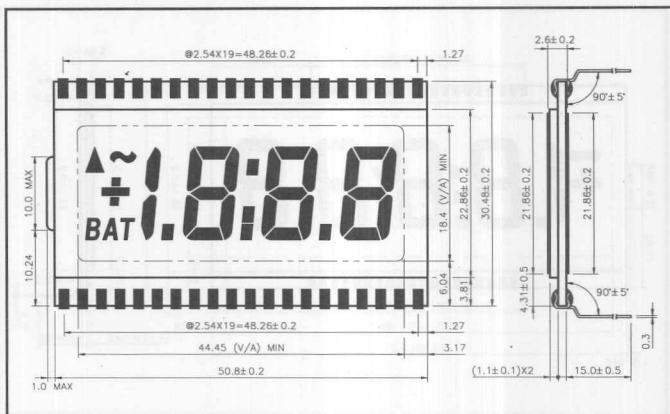
▼ WK-TP2169-FG



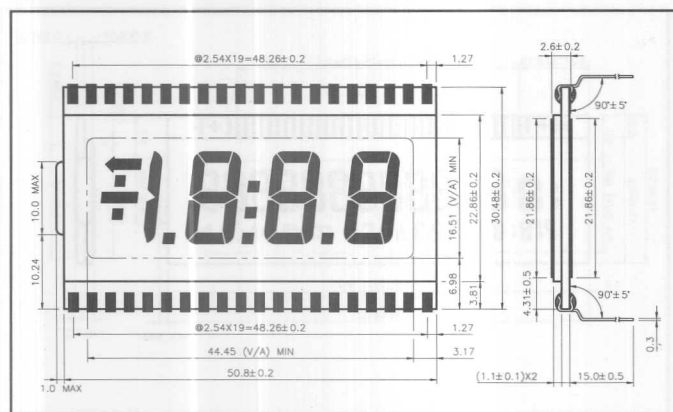
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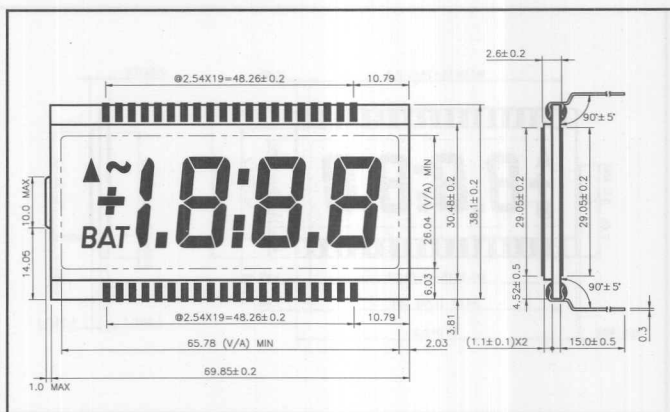
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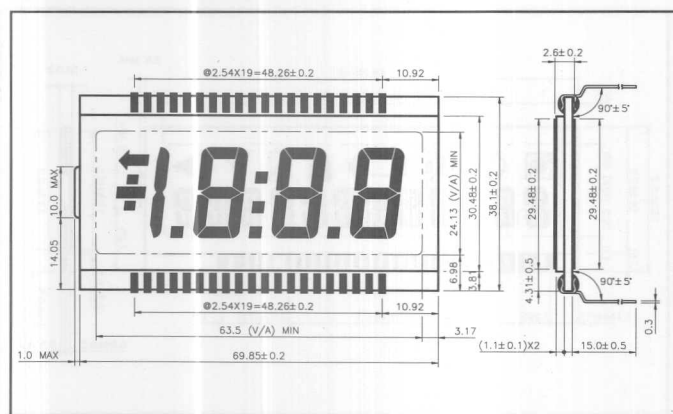
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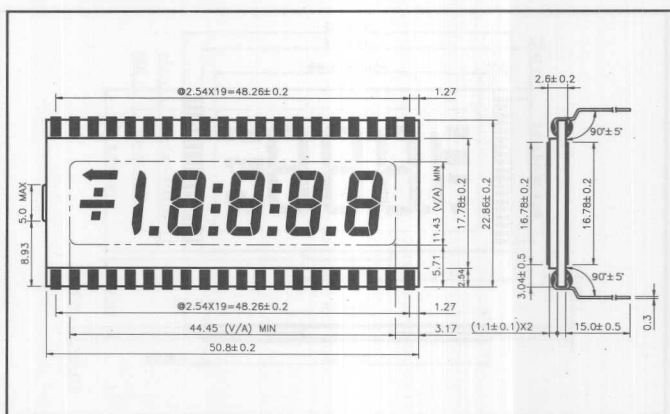
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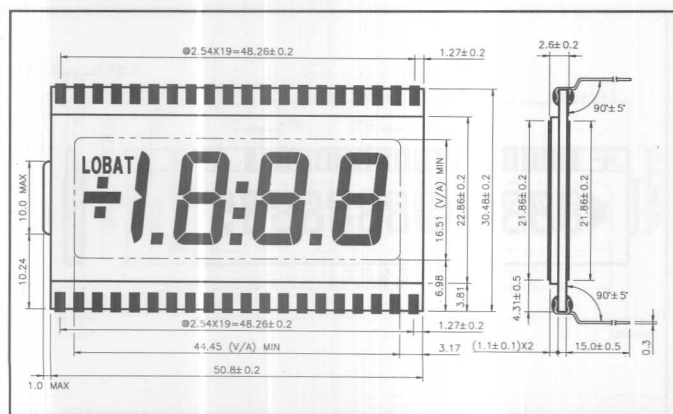
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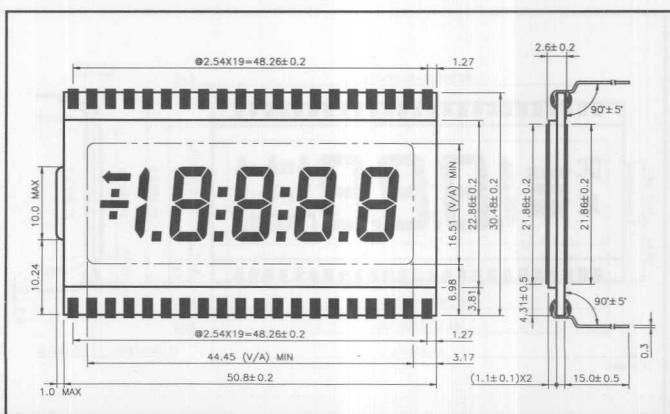
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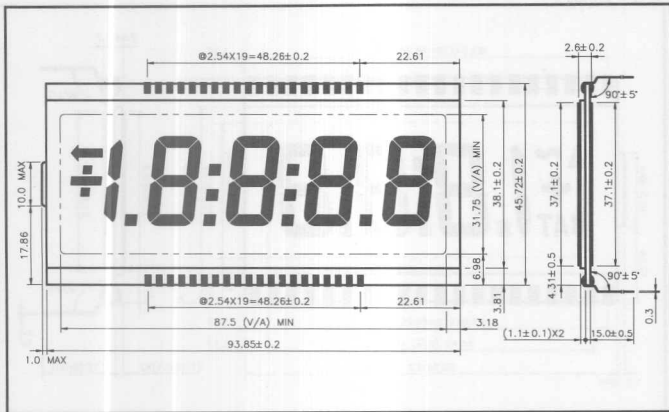
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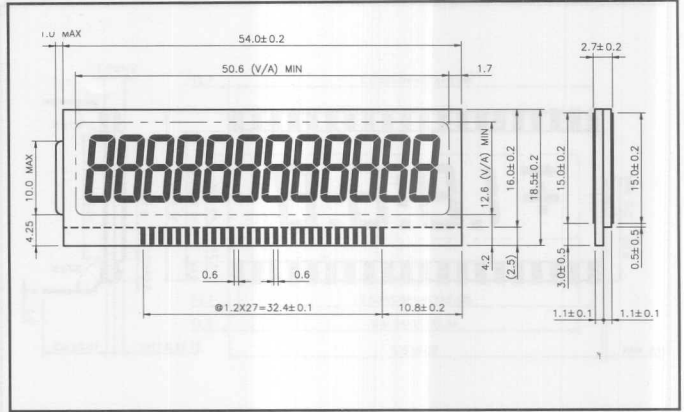
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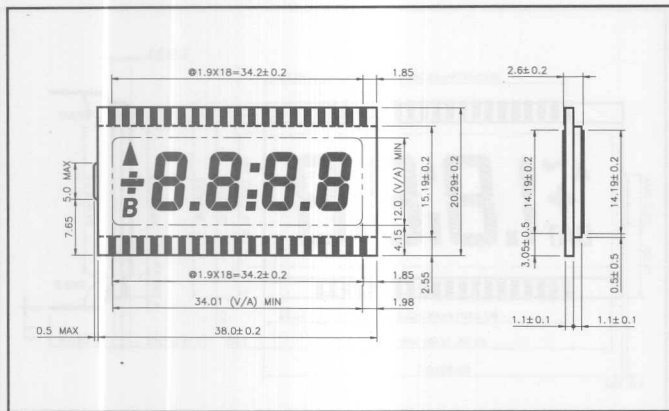
▼ WK-TP2771-RG



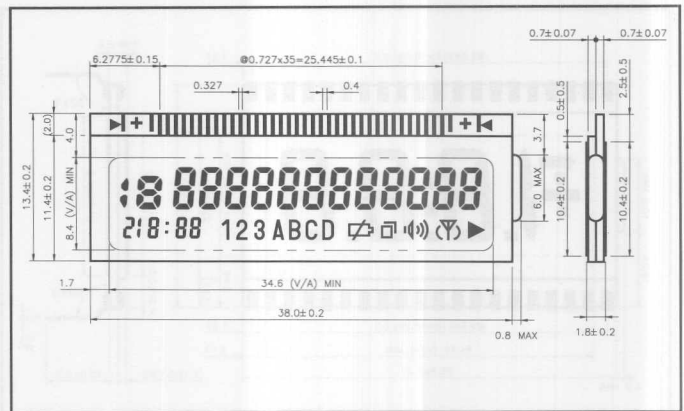
▼ WK-TZ3001-RG



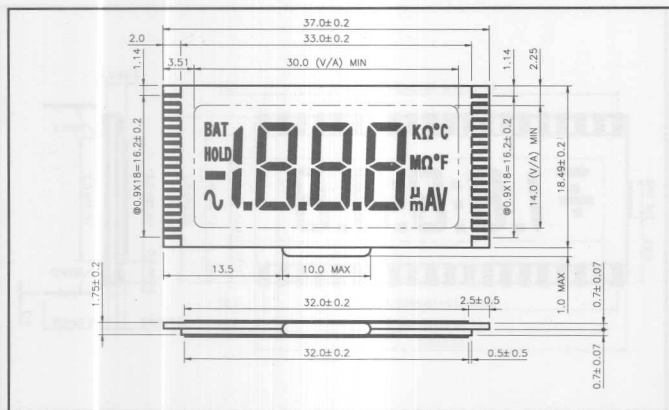
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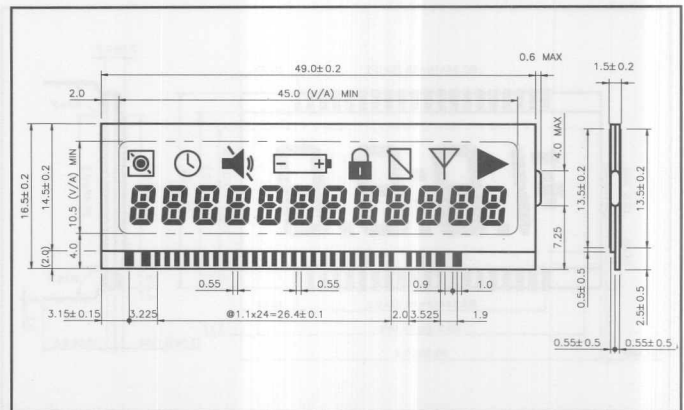
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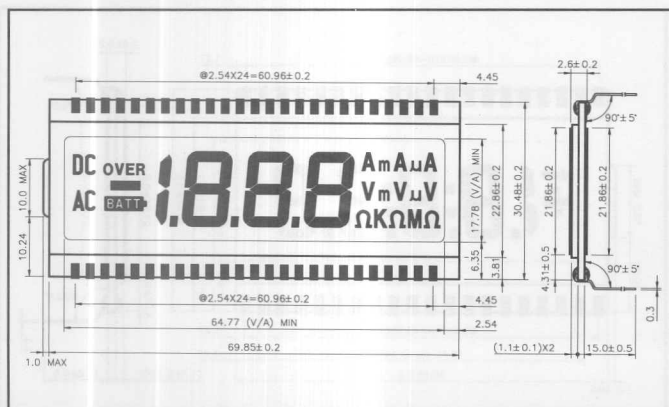
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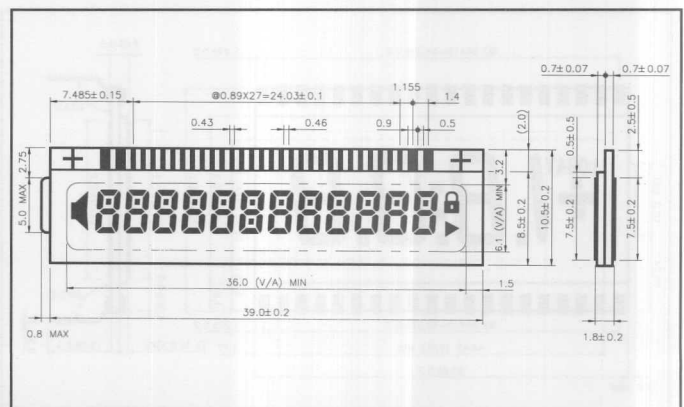
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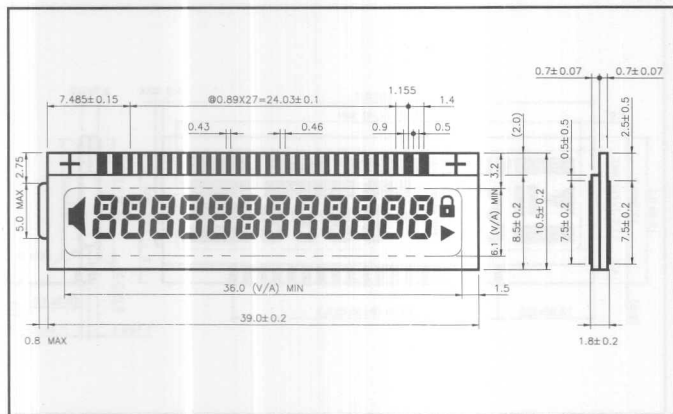
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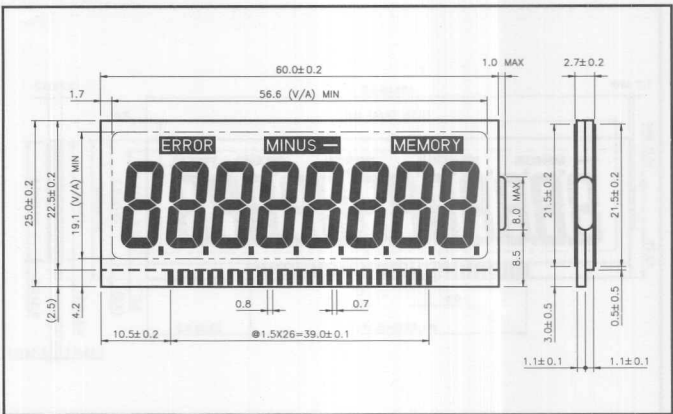
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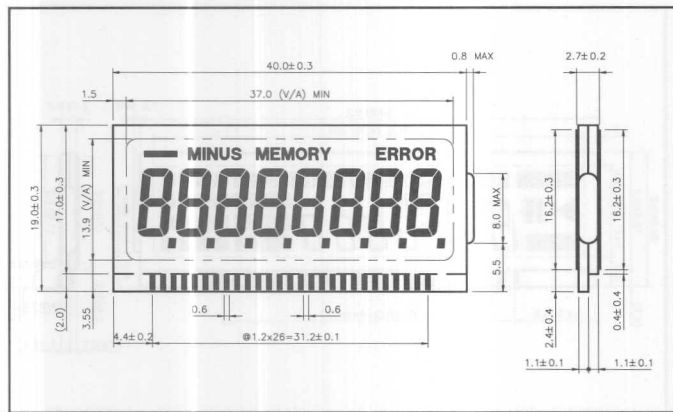
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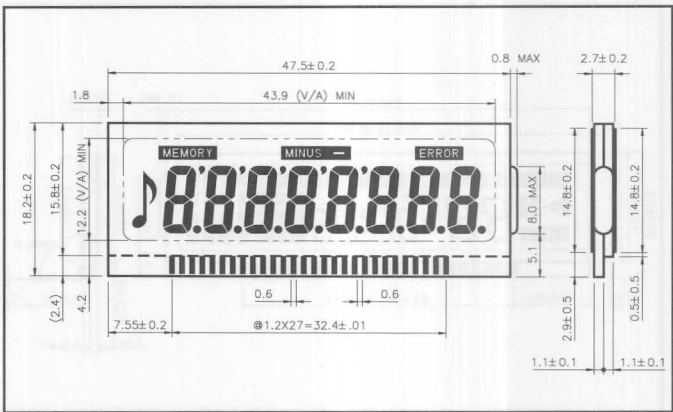
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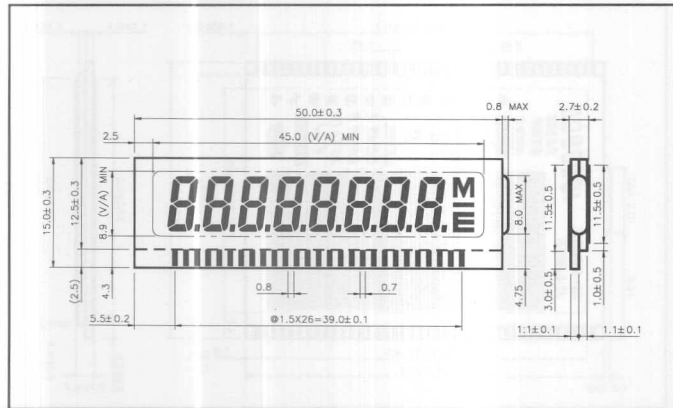
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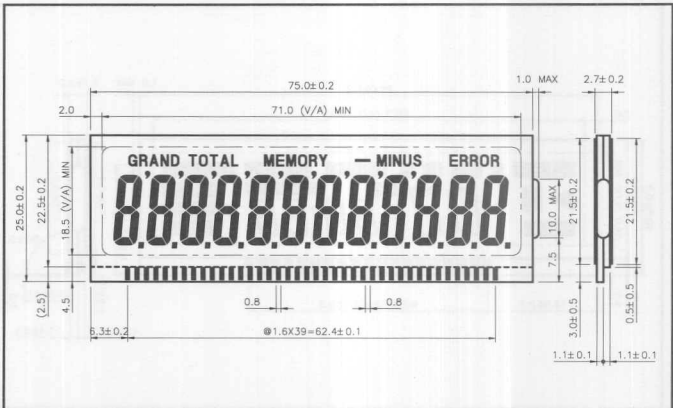
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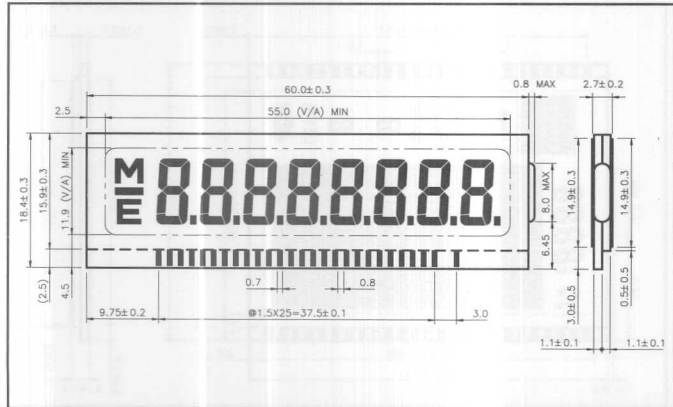
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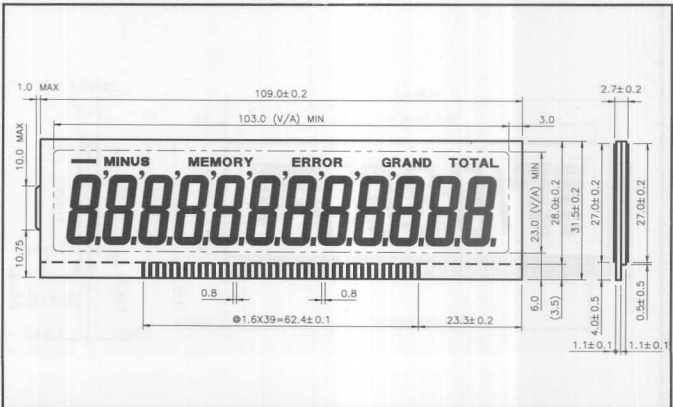
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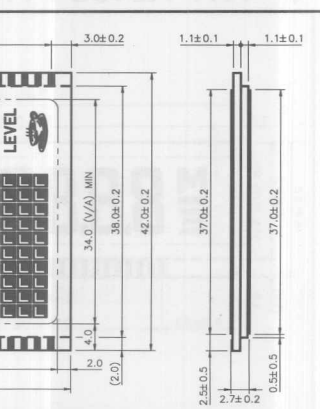
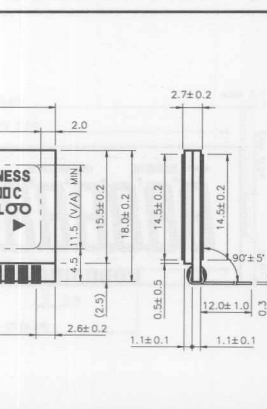
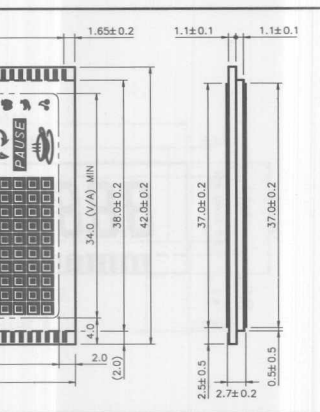
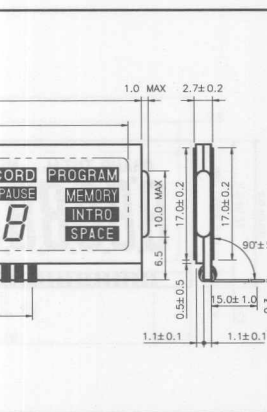
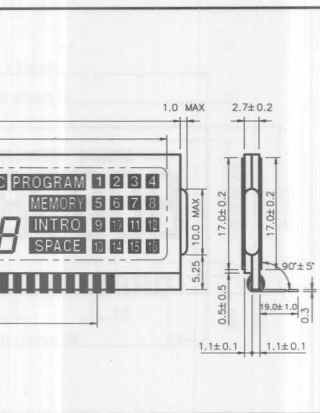
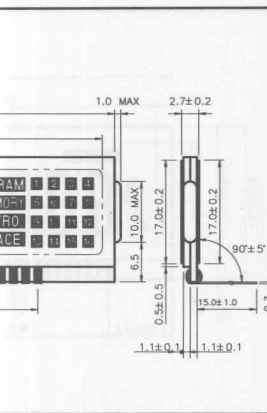
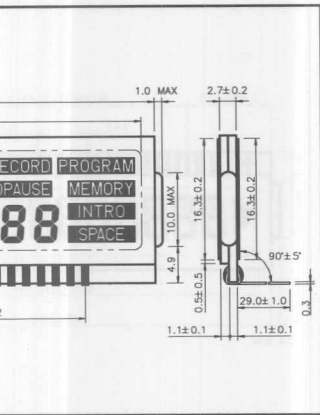
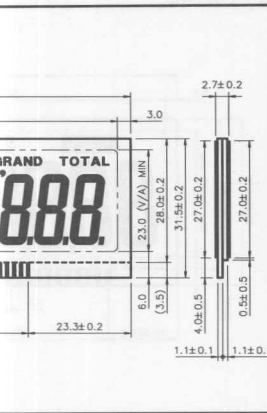


▼ WK-TZ4004-RG



▼ WK-TZ4039-RG





**▼ PROCEDURE**

LEAD TIME FOR LCD.:

- 1) Counter Drawing : 7 days
- 2) Prototype : 14-21 days after confirmed the drawing.
- 3) Mass Production : 30-45 days after confirmed the prototype.

Please make a photocopy of this and send it to us filling necessary information on your inquiry and sample ordering.

APPLICATION	<input type="checkbox"/> Clock (Watch) <input type="checkbox"/> Car stereo <input type="checkbox"/> Instruments <input type="checkbox"/> Game <input type="checkbox"/> OA machine <input type="checkbox"/> Dot Matrix <input type="checkbox"/> Calculator <input type="checkbox"/> Others
DRIVE METHOD	Driving Voltage: _____ Vop <input type="checkbox"/> Static <input type="checkbox"/> Dynamic Duty: _____ Bias: _____ Driver (IC) : _____ Freq: _____ Hz
VIEW DIRECTION	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> 3 O'clock <input type="checkbox"/> 9 O'clock <input type="checkbox"/> Others _____
POLARIZER	Front Polarizer: <input type="checkbox"/> Pasted <input type="checkbox"/> Separated Rear Polarizer: <input type="checkbox"/> Pasted <input type="checkbox"/> Separated <input type="checkbox"/> Reflective <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective (Semi-transmissive) Color: _____
DISPLAY MODE	<input type="checkbox"/> Positive Image <input type="checkbox"/> Negative
CONNECTOR	<input type="checkbox"/> Zebra <input type="checkbox"/> Pin <input type="checkbox"/> Heat seal
TEMPERATURE RANGE	Operating Temperature: _____ °C ~ _____ °C Storage Temperature: _____ °C ~ _____ °C

DIMENSIONS	<p>Please attach drawing with graphic and wiring connection or send sketch or artwork of data to be displayed available.</p> <div style="text-align: center;"> </div> <p> A...Width of Glass : _____ mm B...Front Glass : _____ mm(H) C...Rear Glass : _____ mm(H) D...Viewing Area : _____ mm(W) E...Viewing Area : _____ mm(H) F...Terminal : _____ mm(H) G...Seal width I : _____ mm H...Seal width II : _____ mm I...Pitch of terminal Electrodes: _____ mm J...Glass thickness: _____ mm(H) K...Total thickness: _____ mm(W) L...Height of The Pattern: _____ mm M...Glass Edge to First Terminal Electrode: _____ mm N...Position of Injection port <input type="checkbox"/> Right <input type="checkbox"/> Left </p>
LCD CONFIGURATION	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/> (3) <input type="checkbox"/> (4) <input type="checkbox"/> (5) <input type="checkbox"/> (6) <input type="checkbox"/> (7) </div> <div style="display: flex; align-items: center;"> </div> <div style="margin-left: 10px;"> <input type="checkbox"/> Others </div> </div> <p>The bold lines show the terminal electrodes.</p>
SCHEDULE	<p>A. Counter drawing for approval by: _____</p> <p>B. Operating sample for approval by: _____</p> <p>C. Mass production starting from: _____</p> <p>Order volume: _____ pcs/month</p> <p>Total: _____ pcs</p>
OTHER CONDITIONS	<p>_____</p> <p>_____</p> <p>_____</p>

COMPANY: _____

ADDRESS: _____

PHONE: _____ FAX: _____ DATE: _____

ATTENTION: _____

▼ Application notes

1. Safety Instructions

The liquid in the LCD should not be swallowed or touched. If it accidentally gets on your hands, wash them with water.

2. Handling Instructions

The LCD panel is a glass product developed through precision processing and special orientation treatment. If pressure is applied to the panel, therefore, orientation may be disturbed, making it difficult to return to its original condition. It is apt to crack or be broken easily if it is dropped or hit to a hard object, particularly around the edges. Attention must be paid to avoid external shock.

3. Mounting Instructions

- a. When connecting a LCD panel to circuit board, it is recommended to use a rubber connector or flexible connector. Direct soldering or mechanical connection is not possible. The pin connected type LCD permits soldering of pins.
- b. When mounting a LCD panel on a cabinet, care must be taken not to apply excessive force on the display surface of the panel with a fingertip, etc. Otherwise, it may cause an operating failure or will shorten the lifetime of the panel.
- c. DC voltage or driving voltage higher than the specified voltage will reduce the lifetime of the liquid crystal display panel.
- d. LCD panels should be handled with care during shipment. If, however, the terminals are contaminated, wipe off with alcohol.
- e. The polarizer must be handled carefully, because it is soft and apt to suffer damage. If a protective panel is attached to the polarizer to avoid damage and contamination, it should be removed just before use as much as possible.
- f. Use a dry, soft cloth to clean the polarizer, if contamination persists, wipe it off with a small amount of petroleum benzene. Avoid using an organic solvent as much as possible.
- g. When attaching with the heat seal or anisotropically conductive film, wipe off with alcohol before use.

4. Storage instructions

- a. Avoid storage in high temperature and high humidity. When long-term storage is required, keep the panels at a temperature of 15 to 35°C and at a relative humidity of 65% or less.
- b. The LCD unit should be stored in a dark place, do not expose it to direct sunlight or fluorescent lamps.
- c. Note that the presence of waterdrops or dew in the LCD panel may deteriorate the polarizer or corrode the electrode.

NETWORK



2,690m² (TAIWAN PLANT 1)
HEAD OFFICE & FRONT END PLANT



1,720m² (TAIWAN PLANT 2)
MODULE DEPT & BACK END PLANT



5,428m² (MAINLAND/DONG-GUAM)
BACK END PLANT



4,500m² (TAIWAN PLANT 3)
ITO COATING PLANT



1,400m² (MAINLAND/BAO-AN)
BACK END PLANT

HEAD OFFICE
& PLANT 1

PLANT 2

PLANT 3

PLANT LOCATION IN TEPZ



勝華科技股份有限公司 WINTEK CORPORATION

HEAD OFFICE & PLANT

台中縣潭子鄉台中加工出口區建國路9-2號
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427 TAIWAN, R.O.C.
TEL:886-4-5347288 FAX:886-4-5310868

▼台北辦事處

台北市信義路五段五號(台北世界貿易中心展覽大樓3B23室)
TAIPEI OFFICE:3B-23 ROOM, TAIPEI WORLD TRADE
CENTER EXHIBITION HALL, 5 HSIN YI ROAD, SEC.5,
TAIPEI, TAIWAN, R.O.C.
TEL:02-3450390.7253875.7253876 FAX:02-3455590

▼萬事達亞太有限公司

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